PUBLIC HEALTH REPORTS

In this issue

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service

World Health Day

April 7, 1954

see overleaf

Volume 69 Number 4 **April 1954**

PUBLIC HEALTH REPORTS

Published since 1878

Contents

	Page
The magnitude of the cancer problem *Sidney J. Cutler and William M. Haenszel.*	333
Health clinics in the Helembu, Nepal—High altitude health survey *George Moore.*	340
Enforced legal isolation of tuberculous patients—The California experiment *Edward Kupka and Marion R. King.*	351
Tuberculosis among college students—Report on a 4-year case-finding and followup program at Florida State University *Thomas J. Brooks, Jr.*	360
The gold-headed cane in the laboratory *René J. Dubos.*	365
The public health training program in Pennsylvania *Karl M. Mason.*	372
Federal fund accounting system in California *Robert G. Webster and G. Leonard Johnston.*	375
A decentralized system of health department accounting in Tennessee *Hugh B. Halliburton.*	376
The National Science Foundation and the life sciences *Alan T. Waterman.*	378
Mosquito distribution and abundance in the Arkansas-White-Red River Basins States *Travis E. McNeel and Frederick F. Ferguson.*	385
Well drilling and latrine construction in rural Burma *Clarence J. Feldhake.*	391
Self-survey of health facilities in Auburn, Massachusetts *Margaret H. Blute.*	398
Public health contrasts in Hawaii, 1850–1953 *Richard K. C. Lee.*	403

Continued ▲

290443—54——1

A mother shows her son to a visiting public health nurse in Guazapa, El Salvador.

The Nurse: Pioneer of Health

The choice of this year's World Health Day theme, "The Nurse—Pioneer of Health," was inspired by Florence Nightingale's visit to the warfront hospitals in the Crimea 100 years ago and by her pioneering work in developing nursing as a professional discipline.

The Director-General of the World Health Organization, Dr. M. G. Candau, stated in his message:

"The nurse of today, whether at the bedside, in the operating theatre, in the clinic, the school or the home, is the friend and counselor of all and a welcome health teacher. Her importance in local health work and in community life is second to none. In addition to helping mothers and children, assuring that the community resources for prevention and care of disease are fully utilized, she often acts as the confidant of people who would take their personal problems to no one else. In most cases she is a necessary link between the individual on the one hand, and the physician and the public health agencies on the other.

"The world needs more and yet more nurses. In the more fortunate parts of our planet it is estimated that there is one professionally trained nurse to every 300 of the population. But in some other countries the ratio is about 1 to 100,000.

"I therefore express the hope . . . that one result of the observance . . . will be that still more young women of character may be led to consider, as the field for their future career, the rewarding profession of nursing."

frontispiece . . .

Left: Candidate, with parent, arrives to register for nurse's training course given by the WHO maternal and child health demonstration team at Lahore Hospital, Pakistan. Top right: WHO nurse and midwife interpreter give talk on hygiene to mothers as part of the WHO nursing education project, Brunei, Borneo. Lower right: A WHO nurse explains the use of the basic instrument kit necessary for birth to a midwife in El Salvador.

WHO photographs

Contents for April, continued

	Page
Brucellosis control	410
The public health approach — *Joseph O. Dean.*	410
Briefs:	
Human brucellosis — *Norman B. McCullough.*	413
Pathology and transmission — *I. Live.*	414
The Pennsylvania program — *H. A. Milo.*	416
Veterinarian's viewpoint — *C. J. Hollister.*	417
Reported cases of venereal disease in the United States, fiscal 1952 and 1953	419
Short reports and announcements:	
World Health Day	Frontispiece
The nurse: Pioneer of health	ii
Nurses conference on VD control concepts	339
Conference on needs of migrants	350
From the *Social Security Bulletin*	364
Russell M. Wilder Fellowship established	371
Departmental appointments	384
Ideas	390
Venereal disease conference for nurses	397
Dedication of the Sanitary Engineering Center	409
. . . not in any newspapers . . .	418
Bureau of State Services reorganization	422
Technical publications	423

PUBLIC HEALTH REPORTS

G. ST.J. PERROTT, *Managing Director*
Acting Executive Editor
Chief, Division of Public Health Methods

EDITORS

Chairman of the Board of Editors
EDWARD G. McGAVRAN, M.D., M.P.H.
Chapel Hill

TAFT S. FEIMAN
Managing Editor

WINONA E. CARSON
Asst. Managing Editor

BOARD OF EDITORS

GAYLORD W. ANDERSON, M.D., DR.P.H.
Minneapolis

JUSTIN M. ANDREWS, SC.D., LL.D.
Washington

HALBERT L. DUNN, M.D., PH.D.
Washington

MARTHA M. ELIOT, M.D., SC.D.
Washington

RUTH FREEMAN, R.N., ED.D.
Baltimore

JOHN W. KNUTSON, D.D.S., DR.P.H.
Washington

BASIL C. MACLEAN, M.D., M.P.H.
Rochester, N.Y.

M. ALLEN POND, M.P.H.
Washington

FILLMORE SANFORD, PH.D.
Washington

GEORGE M. UHL, M.D., M.S.P.H.
Los Angeles

RUSSELL M. WILDER, M.D., PH.D.
Rochester, Minn.

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
OVETA CULP HOBBY, *Secretary*

PUBLIC HEALTH SERVICE
LEONARD A. SCHEELE, *Surgeon General*

The Magnitude of the Cancer Problem

By SIDNEY J. CUTLER, M.A., and WILLIAM M. HAENSZEL, M.A.

CANCER is the second leading cause of death, ranking next to diseases of the heart. It now accounts for approximately 1 in every 7 deaths in the United States, with an annual toll of approximately 225,000 deaths.

Because of the lack of information from other sources, mortality data, in the past, have been relied on as a measure of the cancer problem. Important as they are, death statistics by themselves cannot define the problem adequately. As therapy becomes increasingly effective, the more curable types of cancer will appear less frequently in mortality records. Furthermore, the medical certification of death cannot be viewed as a complete clinical history. In reporting the sequence of morbid events leading to death, the number of persons dying with cancer is inevitably understated. This can occur because the certifying physician may not know or may neglect to indicate that cancer was present, or because death was obviously due to some cause unconnected with the presence of cancer.

Mr. Cutler is an analytical statistician with the Biometry Section in the National Cancer Institute, National Institutes of Health, Public Health Service. Before joining the Public Health Service in November 1948, he was an analytical statistician with the Air Force School of Aviation Medicine (1947–48) and a senior statistician with the New York City Health Department (1946–47).

Mr. Haenszel is head of the Biometry Section of the National Cancer Institute. He was director of the bureau of vital statistics, Connecticut Department of Public Health, for 5 years and before that time a statistician with the New York State Department of Health, in Albany.

Estimates of Cases

One method of obtaining data on the type and amount of illness in the population is the so-called household survey or family interview. This method is not suitable for cancer studies, and its failings may be attributed to the inability of the respondent to supply the correct information, because the physician may not have informed the family of the diagnosis, or because of the respondent's lack of familiarity with technical terms, or his unwillingness to discuss the subject with an interviewer.

The approach adopted by the National Cancer Institute of the Public Health Service has been to canvass all the diagnostic sources within a community—hospitals, clinics, laboratories, practicing physicians—and to obtain names of all persons coming to diagnosis or currently under treatment, so that an unduplicated count of persons ill with the disease might be made. Ten urban areas (Atlanta, Birmingham, Chicago, Dallas, Denver, Detroit, New Orleans, Philadelphia, Pittsburgh, and San Francisco) were surveyed by the Institute in 1937–39 and resurveyed in 1947 and 1948. To insure as complete coverage as possible, data on cancer deaths were obtained at the same time from city and State offices of vital statistics. The mor-

tality records provided information on cancer cases not reported by other sources.

These cancer morbidity surveys have yielded a wealth of information for evaluating the size and nature of the cancer problem. Separate reports have been issued on each of the 10 areas (*1*), and a summary report is now being prepared. This paper contains a discussion of some of the broad implications of the findings of this series of 10 cancer surveys.

In the 10 cities resurveyed in 1947 and 1948, cancer was diagnosed at an annual rate of 319 new cases per 100,000 population; of every 100,000 persons, 430 were under treatment for the disease sometime during the year. Since the average age of the 10-city population is somewhat younger than for the country as a whole, rates for specific age categories were computed and applied to the age distribution of the United States population in 1950, for the purpose of making national estimates. The incidence rate (new cases per year per 100,000 population) for the United States is estimated to be 328, and the prevalence rate (cases under treatment during the year per 100,000 population) is estimated to be 441. The estimated rates may overstate the true rates for the total United States since current evidence suggests that rates are higher in urban than in rural areas. However, this may compensate for undiagnosed cases for which no allowance has been made.

The age-specific cancer illness rates can also be used for making forecasts. Estimates for the United States of the number of newly diagnosed cancer cases, cases under treatment, and deaths for 1940, 1950, and 1953, and forecasts of these numbers for future years, 1960–75, are presented in table 1. The forecasts were made on the assumption that the prevailing age-specific rates will continue. In the 10-year period 1937–47, the age-specific incidence rates increased an average of 14 percent. It is likely that further increases in the rate of cancer incidence will be observed during the next 2 decades, as a result of improved diagnostic and case-finding techniques or increased exposure to carcinogenic hazards. Thus, the projected figures may be considered to be minimal.

Even if the current age-specific incidence, prevalence, and mortality rates were to remain constant, the number of persons affected by cancer will increase by about 50 percent during the next 25 years. This is true for two reasons: The total population of the United States is expected to increase, and the proportion of persons in the older age groups is expected to increase (*2*). For example, in 1950, 8.2 percent of the population was 65 years of age or older; this proportion is expected to increase to 10.4 percent by 1975. Thus, we see that the expected population trend alone will greatly increase the magnitude of the cancer control problem in the United States, even if the rate of cancer incidence remains constant.

Table 1. Estimates [1] of cancer incidence, prevalence, and mortality, United States, 1940–75

Year	New cases	Cases under treatment	Cancer deaths
1940	380, 000	528, 000	[2] 165, 255
1950	497, 000	668, 000	[2] 210, 733
1953	530, 000	711, 000	225, 000
1960	605, 000	811, 000	259, 000
1965	656, 000	879, 000	282, 000
1970	706, 000	945, 000	304, 000
1975	753, 000	1, 008, 000	326, 000

[1] Estimates are based on Census Bureau population projections—Current Population Reports (*2*), Series P–25, No. 78 (Aug. 21, 1953).

[2] Actual number reported by the National Office of Vital Statistics, Public Health Service.

Age Differences in Cancer Incidence

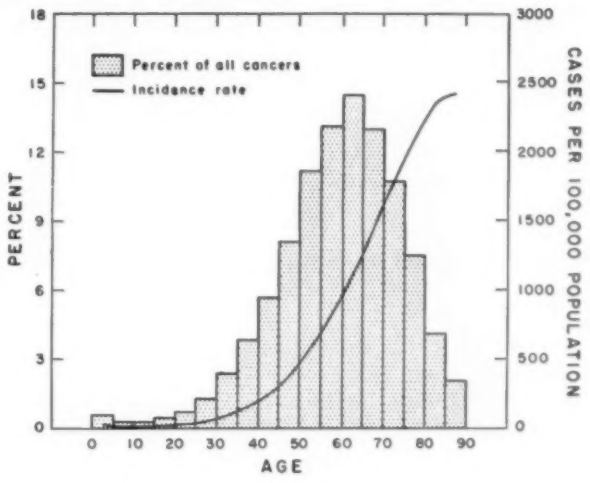
The incidence of new cases of cancer increases very rapidly with increasing age. For example, the incidence rate is about 40 per 100,000 population at age 25, 475 at age 50, and 1,900 at age 75. The changes in cancer incidence with respect to age are shown, as a curve, in the chart. There is only one reversal in the increasing rate with increasing age. This occurs at the very young ages. The incidence rate among children under 5 years of age is higher than in children 5 to 14.

We are inclined to emphasize the increase in cancer illness at the older ages, and this is natural, because the rates at the older ages are high. However, when we think in terms of

actual numbers of new cases, we must not overlook the very substantial number among children and young adults. For example, roughly 1 of 6 newly diagnosed cases was under 45 years of age. The chart illustrates the difference between the age distribution of newly diagnosed cases of cancer (shown as a series of columns) and the variation, with respect to age, of the rate at which cancer occurs (shown as a curve). After early childhood, the proportion of new cases in each 5-year age group increases to a peak at 60 to 65 and then decreases. The age at which the greatest number, or proportion, of cases occurs depends on the age distribution of the population from which the cancer cases are drawn. For example, if the population of the United States were older, the peak might occur at ages 65 to 70, whereas if the population were younger, the peak might occur at ages 55 to 60. The cancer incidence rate, however, continues to increase into very old age.

It is important to differentiate between the information provided by a percentage distribution of newly diagnosed cases and that provided by age-specific incidence rates. The age-specific cancer incidence rates provide a measure of the risk of developing cancer during a specified period of time (1 year, 5 years, and so forth) for persons of a given age or age group. They also serve as an index of the case-finding rate one may expect in different age groups in the population. The age distribution of newly diagnosed cases cannot be used as a measure of risk or rate of case finding, unless we know the age distribution of the population from which these cases came. Approximately 4 percent (3.8 percent) of persons with newly diagnosed cancer were 35–39 years of age. Another 4 percent (4.1 percent) were 80–84 years of age. However, the number of persons in the population who are 35–39 years of age is far greater than the number 80–84 years of age. (In 1950 in the United States, there were 11,246,000 persons 35–39 years of age and 1,059,000 persons 80–84 years of age.) Thus, when the number of diagnosed cases (approximately equal in the 2 age groups) is divided by the number of persons in each age group, the annual cancer incidence rate becomes 148 per 100,000 persons

Newly diagnosed cases of cancer, 10 urban areas, 1947—percentage distribution and rate of incidence, by age.



35–39 years of age compared to a rate of 2,372 per 100,000 persons 80–84 years of age.

Both types of information are important and useful. For example, in planning a large-scale cancer case-finding program, we would have to compromise between at least three conflicting goals in applying any specified technique: (*a*) finding cases among relatively young people, in order to salvage the maximum number of productive years of life; (*b*) producing a high proportion of positives in the screened population, to make the program economical; and (*c*) finding as many cases as possible, in order to save the maximum number of lives.

Concentration on young people, let us say persons 30 to 50 years of age, would satisfy the first goal. However, the rate of cancer incidence is relatively low in this age group. Consequently, the proportion of cases found in the screened population would be low, and the number of cancers discovered would also be small. Concentration on old people, let us say persons 70 years of age and older, would produce a high proportion of positives since the cancer incidence rate is high among old persons. However, this approach ignores the desirability of salvaging productive years of life, and it would also produce a small number of cases since the number of old people in the population is relatively small. Concentration on persons 50 to 70 years of age would be fairly productive for two reasons: The rate of can-

cer incidence among persons in this age bracket is sizable, and about half of all cancer cases diagnosed during any time period are found among persons in this age category. Thus, a relatively large number of cases would be found and the case-finding rate would be relatively high. The decision as to which age segments of the population to concentrate on would depend on the specific aims of the program.

Probability of Developing Cancer

In the analysis of data relating to cancer or certain other chronic diseases, the use of measures based on 1-year exposure to risk (annual rates) for incidence or mortality seems particularly inadequate. For most forms of cancer, long latent periods between exposure to carcinogenic agents and development of neoplasms are suspected. Consequently, cancer investigators need to follow population groups over long periods of time and tend to think in terms of the risk of developing the disease over intervals as long as 10 or 20 years. For many purposes, the size of study groups needed to yield significant results can be held at manageable proportions only by arrangement for prolonged observation or followup.

The scientific viewpoint coincides with popular interest. An individual is not too greatly interested in the probability of his developing cancer within the next year. He is more concerned with the chances of developing cancer between his present age and the close of his working career, age 65 or 75, or at any future time during his life. Answers to when a person may be expected to develop cancer in the future may be found by resorting to conventional life table methods, and depend on the interplay of two forces—the schedule of age-specific cancer incidence rates and the risk of removal from the population by competitive causes of death.

The probabilities in table 2, for selected intervals of the life span, are based on the cancer incidence rates of the 1947 survey and general mortality experience during 1950 (except for the set of 1940 figures presented for comparison). Under current conditions, 32 of every 100 newborn children may be expected to develop cancer at some time during their life; cancer would develop in 3 persons before age 45, and 14 and 23, respectively, are the corresponding figures for ages 65 and 75. Examination of the table reveals the striking magnitude of the risks encountered in the portions of the life span after age 45. The slightly higher probabilities at age 20 than for the corresponding figures at time of birth result from the comparatively high mortality during infancy from causes other than cancer.

Table 2. Percentage of persons expected to develop cancer during their future lifetimes, by age, 1940 and 1950 compared

1940 and 1950 comparisons	Percentages beginning at—			
	Birth	Age 20	Age 45	Age 65
1950: [1]				
By age 20	0. 3	------	------	------
By age 45	3	3	------	------
By age 65	14	15	13	------
By age 75	23	24	23	13
During future lifetime	32	33	32	26
1940: [2]				
During future lifetime	23	25	25	20

[1] Based on 1947 incidence rates and 1950 life table.
[2] Based on 1937 incidence rates and 1940 life table.

By applying the probabilities illustrated in table 2 to the current population of the United States, it is estimated that approximately 50 million people now alive will develop cancer during their remaining lifetimes.

The rise in the age-specific cancer incidence rates between the first and second surveys and the decline in the general mortality level between 1940 and 1950 were both responsible for the shift in the lifetime probability of developing cancer, from 0.23 in 1940 to 0.32 in 1950. The 1937 incidence rates combined with the general mortality level prevailing in 1950 would have yielded a lifetime probability figure of 0.27. Thus, it seems clear that even if the present schedule of age-specific cancer incidence rates were to remain unchanged (as previously indicated, it is more likely that the age-specific rates will continue to increase), an upward trend in the lifetime probability of developing cancer would continue, by virtue of the progressive lowering of mortality from other causes.

Women are more likely to develop cancer sometime during their lives than men; white

Table 3. Lifetime probabilities of developing cancer, age-adjusted cancer incidence rates, and average life expectancy, by color and sex

Color and sex	Lifetime probability of developing cancer (percent)	Age-adjusted cancer incidence rates (per 100,000 population)	Average life expectancy (in years)
White men	31	338	66.6
White women	36	333	72.4
Nonwhite men	17	253	59.2
Nonwhite women	22	293	63.2

NOTE: Based on 1947 cancer incidence rates in 10 urban areas and 1950 life tables for the United States.

persons are more likely to develop cancer than nonwhite persons (table 3). These differences are the result of the interplay of two factors—the schedule of age-specific cancer incidence rates and the average number of years that persons in each color-sex group can expect to live. Of particular interest is the difference in the lifetime probabilities of developing cancer between male and female white persons. Although the cancer incidence rate for white men is slightly higher than for white women, 31 percent of newborn white male children are expected to develop cancer during their lifetimes compared with 36 percent of newborn white female children. The difference is due primarily to the fact that white women can expect to live an average of 72.4 years, while white men can expect to live only 66.6 years.

The probabilities, for white men and women, of developing cancer in six selected site groups are given in table 4. In men, the risk of developing cancer of the digestive system is dominant, with a lifetime probability at birth of 10.3 in 100. In women, the risk of developing cancer by age 65 is highest for the genital organs and breast sites. However, the risk of developing digestive cancer after age 65 increases so rapidly that digestive system outranks genital organs and breast as a cancer risk in overall lifetime probability. In both men and women, the probability of developing cancer of the digestive system from age 65 on is very substantial—9.9 per 100 men and 8.4 per 100 women aged 65.

Early Diagnosis

Early diagnosis of cancer cases is generally recognized to offer the most hope for successful treatment. This principle of cancer control is supported by data collected through followup

Table 4. Percentage of white persons expected to develop cancer during their future lifetimes: six selected site groups by sex and age [1]

Primary site group	Men, beginning at—				Women, beginning at—			
	Birth	Age 20	Age 45	Age 65	Birth	Age 20	Age 45	Age 65
Digestive system:								
By age 65	4.0	4.1	4.0	----	3.3	3.4	3.2	----
During future lifetime	10.3	10.8	11.1	9.9	9.8	10.2	10.2	8.4
Respiratory system:								
By age 65	1.9	2.0	2.0	----	.4	.4	.4	----
During future lifetime	3.4	3.5	3.6	2.3	.9	.9	.9	.6
Breast:								
By age 65	----	----	----	----	4.0	4.1	3.3	----
During future lifetime	----	----	----	----	7.5	7.8	7.1	4.6
Genital organs:								
By age 65	.7	.7	.6	----	4.5	4.7	3.8	----
During future lifetime	4.0	4.2	4.3	5.1	7.2	7.4	6.6	3.4
Urinary organs:								
By age 65	.9	.9	.9	----	.4	.4	.4	----
During future lifetime	2.3	2.4	2.4	2.2	1.4	1.5	1.5	1.3
Skin:								
By age 65	2.2	2.3	2.0	----	1.7	1.8	1.4	----
During future lifetime	5.1	5.3	5.2	4.4	4.6	4.7	4.5	3.7

[1] Based on 1947 incidence rates and 1950 United States life table.

of cancer patients. Information on the survival experience of cancer patients with respect to the stage of development of the cancer at the time it was diagnosed is contained in table 5. The data are drawn from the cancer register maintained since 1935 by the State of Connecticut (*3*) and from the cancer morbidity surveys conducted by the National Cancer Institute in 10 urban areas, in 1947–48 (*1*). Each series is based on the experience of more than 40,000 cancer patients.

Table 5. Number of survivors out of every 100 diagnosed cases of cancer, by stage at diagnosis

Stage at diagnosis	10 urban areas [1]	Connecticut		
	1 year	1 year	5 years	10 years
All cancers	64	54	27	16
Localized	84	72	43	26
Regional involvement	58	50	20	11
Remote metastases	28	14	3	1

[1] Surveyed by the National Cancer Institute, Public Health Service, in 1947–48.

Examination of table 5 indicates that the chances for survival of cancer cases diagnosed early (while localized at the site of origin) are much better than for cases diagnosed after the tumor has spread to adjacent tissues (regional involvement) or to other organs (remote metastases). For example, of every 100 persons diagnosed as having cancer while localized, 43 lived for at least 5 years after diagnosis, whereas of every 100 persons diagnosed as having cancer after other organs had been invaded only 3 survived 5 years.

In view of the evident benefits of early diagnosis, it is unfortunate that only half of all persons with cancer are being diagnosed while the disease is localized at the site of origin. This record could be improved materially, because half of all cancers develop in organs accessible to direct examination by the physician in his own office. Yet, only 62 percent of cancers developing in accessible sites are discovered in an early stage, and when skin cancers, which generally do not spread to other organs, are excluded, only 50 percent of accessible cancers are diagnosed early. The record of each accessible site with respect to the percentage of cases diagnosed while localized is shown in table 6. Noteworthy here is that in cancer of the breast—a highly accessible site—only 2 of every 5 cases are diagnosed while the cancer is localized. For cancer of the rectum, in both sexes, the proportion is less than half; for cancer of the prostate, one-half; and for cancer of the uterus, the proportion is less than 3 out of 5.

Table 6. Cancer sites accessible to direct examination: percentage diagnosed while localized, by sex, 10 urban areas, 1947–48

Men			Women		
Primary site	Percentage of all newly diagnosed cases	Percentage diagnosed while localized	Primary site	Percentage of all newly diagnosed cases	Percentage diagnosed while localized
Skin	15.4	94	Breast	21.7	40
Prostate	9.5	50	Uterus	18.9	57
Rectum	6.5	45	Skin	10.7	95
Mouth and pharynx	6.3	61	Rectum	4.5	46
Thyroid	.3	49	Mouth and pharynx	2.0	74
			Thyroid	1.1	65
Total accessible sites	38.0	70	Total accessible sites	58.9	58
Total accessible sites (excluding skin)	22.6	52	Total accessible sites (excluding skin)	48.2	49

Summary

The annual number of persons diagnosed with cancer is expected to increase from 530,000 in 1953 to 753,000 in 1975. This estimated increase is based solely on two factors: the forecast increase in the number of persons in the United States, and the forecast increase in the proportion of older people in the population.

Though the figures on the annual number of new cancer cases are impressive, they do not provide an entirely satisfactory measure of the cancer problem. A more satisfactory measure is provided by estimating the probability of developing cancer by a specified age, or during a person's future lifetime. Application of the age-specific cancer incidence rates observed in 10 urban areas in 1947 to the 1950 life table revealed that roughly 50 million people alive in 1950 can expect to develop cancer during their remaining lifetimes, and that one-third of newborn children are expected to develop cancer during their lives. If cancer incidence rates and life expectancy continue to increase, as they have in the past, a substantially larger proportion of the population may be expected to develop cancer. These figures indicate that in terms of its impact on the population of the United States cancer is a major medical problem and promises to be a more serious problem in the future.

REFERENCES

(*1*) U. S. National Cancer Institute: Cancer illness in 10 urban areas of the United States, Cancer Morbidity Series, Reports 1–10, 1950–52. Washington, D. C., U. S. Government Printing Office, 1952.

(*2*) U. S. Bureau of the Census: Current Population Reports, Population Estimates, Series P–25, No. 78. Washington, D. C., The Bureau, 1953. Processed.

(*3*) Pollack, E. S.: Cancer survival picture brightens. Connecticut Health Bull. 67: 87–93 (1953).

Nurses Conference on VD Control Concepts

The University of Pennsylvania School of Nursing will conduct a work conference on current concepts of venereal disease control from May 24 to June 4, 1954, in Philadelphia. Designed for hospital and public health nursing supervisors, instructors in schools of nursing, consultants, and selected staff nurses from public health agencies, the conference has been organized chiefly to promote nursing education in venereal disease control.

The conference is sponsored by the School of Nursing and the Institute for the Study of Venereal Disease of the University of Pennsylvania in cooperation with the Pennsylvania State Department of Health, the Philadelphia Department of Public Health, and the Division of Special Health Services of the Public Health Service. Its planning committee and teaching staff include faculty members of the Schools of Medicine and Nursing and the departments of sociology and public health of the University of Pennsylvania, staff members of the Philadelphia Department of Public Health, and nurse consultants and physicians of the Public Health Service.

All applications for the conference will be reviewed by a committee on admissions. Requests for application forms should be addressed to Theresa I. Lynch, Dean, School of Nursing, University of Pennsylvania, 3400 Walnut Street, Philadelphia 4, Pa.

Health Clinics in the Helembu, Nepal

By GEORGE MOORE, M.D., M.P.H.

IN the snow-capped Helembu district near the Tibetan border lies Malemchigāon, a Sherpa village in Nepal, at an altitude of 8,000 feet and some 34 miles north of Kathmandu. Tarke Ghyāng, another Sherpa village, lies at an elevation of 9,000 feet on the east side of the mountain stream known as Malemchi Khola. This stream is the source of two other streams, the Indravati Khola and Sun Kosi. Tarke Ghyāng is within sight of Malemchigāon, 4 miles distant. These villages are accessible only by foot over precarious mountain trails.

Both villages—nesting in the heart of the formidable Himalayas—were selected in mid-May 1953 by the Foreign Operations Administration Mission to Nepal as representative Nepalese communities for a study of medical conditions in a high altitude area.

No planned medical survey had ever before been made of the "hill tribes," as the people living in the snow caps—the Sherpas, Piuthanis, Jumlis, and other Bhotias—are all called. Current and proposed FOA health programs in Nepal had hitherto been limited to insectborne disease control in the Terai, the great plains at the foot of the Himalayas, and to the health programs at Kathmandu and Pokhara, both of which are in valleys less than 5,000 feet in altitude. In 1949, a member of an expedition had made some observations on medical and health conditions he saw in the Kali Gandak and Pokhara areas.

Most of Nepal is marked by high mountains, deep ravines, and almost impassable terrain. More than two-thirds of its population live in these mountainous, isolated, and inaccessible regions. There are probably not 7 million people in this small independent kingdom. So far as is known, no accurate count has ever been made, but a rough census, which may include the Helembu district, is now in progress.

Little of this area has been adequately mapped. Maps of Nepal now in general use are based apparently on 1924 surveys. That they are notorious for their errors has been quite well demonstrated by Maurice Herzog, the author of Annapurna.

Although the term "hill area" includes all areas in Nepal above the low Siwalik range, it is probably a little too loose a term to describe the home of the Sherpas in the Helembu. The hill area is roughly divided according to altitudes. Living in the valleys and in areas of less than 5,000 feet are the agricultural folk, the Chetrias, Newaris, and Rais. The sheep-raisers, such as

---

Dr. Moore is chief of the public health division, United States Operations Mission to Nepal under the Foreign Operations Administration. Until recently, the only public health technician in Nepal, where he arrived on October 21, 1952, Dr. Moore is in charge of United States assistance to Nepalese health programs, including the insectborne disease control, village sanitation, and eye disease programs, the training of technicians, and the gathering of data, largely through the survey method, for future health programs in the little known country. On the health expedition to the Helembu district in the Himalayas, Dr. Moore was accompanied by Dr. G. T. Brooks, an entomologist with the Mission.

Formerly venereal disease control officer for the Fort Bragg (N. C.) military area and earlier for Wayne County, Mich. (the Detroit metropolitan area), Dr. Moore is a graduate of Temple University Medical School. He received his master's degree in public health at the University of Michigan in 1951.

The house in Malemchigāon where Dr. Moore held his first clinic in the Helembu and where the FOA team stayed as overnight guests.

the Gurungs and Magars, live in the areas between 5,000 and 6,000 feet. At 6,000 to 8,000 feet, the Tamangs live in relatively isolated spots and manage to survive by working the soil without extensive irrigation. Above 8,000 feet, in the snowcap area, are the Sherpas and other seminomadic tribes who are experts in trading, in some types of weaving, and in raising *chauris* and a few crops. About 100,000 Sherpas live in the area of Helembu in about 1,000 villages.

Any trip from Kathmandu, the capital of Nepal, to the Helembu district is fraught with difficulties. Some of these can be anticipated. Some are unknown. It took 7 days, in constant rain, for the FOA team with its retinue of 2 interpreter-guides, its cook, and 10 Tamang porters to reach Malemchigāon, the first destination in the hills, on June 12, 1953, after starting at 9 o'clock on the morning of June 6 from Sandarijal on the north rim of the capital valley.

On the FOA team were the chief public health officer and the entomologist of the Foreign Operations Administration Mission in Nepal.

Five days were spent in conducting clinics and health surveys in the two villages. A third proposed clinic and survey, to have included the village of Shermathon, failed to materialize because the team's limited medical supplies were exhausted at Tarke Ghyāng, where the second of the two clinics was held.

The early monsoon rains, leech-covered jungle trails, high precipices, malarious ravines, jungles infested with bears, leopards, and lions, the 16,799-foot climb to a snow-covered pass, the fear of legendary flowers with poisonous scent (the Aconitum) and of reported bandits, the language barrier of the Tibetan-like folk, the prospect of an uncertain reception from the proud and independent villagers—all these, plus the team's relative inexperience in mountain-climbing made the trip an exciting challenge.

The leeches, little segmented worms about 2 inches long, were particularly provoking and troublesome until the team reached an altitude of 14,000 feet. Locating a campsite which would be free from this danger was a time-consuming and delaying assignment at the end of the day's march.

Along the trails on each ridge leading to the pass, leeches would lie in the shade and moisture until nearby footsteps vibrated their sense organs. Then, they would inch from rock to rock, at incredible speed, traveling their entire length in about a second toward the sound, and stopping to perch on a rock with their anterior end waving in the air. Immediately they touched a human body, they would quickly fasten themselves to it and search for warm skin. Often, they would drop from trees. They could penetrate eyelets of shoes and pores of socks by lengthening their entire body. Huge clots of dried blood would be found on the skin where the greedy worms had filled themselves to a fragile bursting point, sometimes producing ecchymosis.

The possibility that flowers with a poisonous scent would menace the medical expedition was first learned about in an account by a group of Scottish climbers. The members of the expedition had heard stories about the flower but had failed to find specimens. A trader in Kathmandu, however, substantiated the legend by offering some type of Aconitum as proof. Fearing the scent of the flowers, one of the interpreters carried camphor ice for protection.

At one time, a member of the team was lost for almost an hour at 12,000 feet on the mountain precipice looming high above Malemchigāon. There were snowstorms. There were threats of rockslides.

An especial hazard because of its bulkiness and weight was the 80-lb. drum of DDT which would later be used in the spraying operations in the villages. Often, only one porter could handle the drum on the ledges some 2,000 to 3,000 feet high. One porter refused to continue the climb when the team reached 14,000 feet.

Mlle. Ella Maillart, a Swiss, published another account of this same perilous trail in the *Himalayan Journal* in 1952 under the title "To the Gosainkund." The Gosainkund sacred lakes are the source of the mighty Trisuli River and contain huge boulders under the surface that seem to move like rising spirits when the water ripples. Pilgrims from India often travel to this area to worship.

The Mountain People

The Sherpas are sturdy-looking, long-limbed Mongoloids, not unlike the Tibetans in manner and appearance. They love their mountain freedom. When treated with rebuke or scorn, they respond in kind or with short-tempered violence. But when dealt with kindly, they reciprocate with friendliness. The Sherpas, incidentally, are much sought after by climbing expeditions. Tensing, one of the heroes of the recent Mt. Everest expedition, is a Sherpa. These seminomads are dependable, loyal, strong, and rugged. Although shorter in stature than most Westerners, they are taller than the average Nepalese.

In former times, the Ranas would seek their wives from the Helembu area—the women are beautiful. Their skin is light bronze. Their complexion is excellent. The features are soft but pronounced, and all women have a graceful, lithe figure.

A Nepalese woman from the district dresses in a *cholo* (a cotton blouse with long sleeves), *farriya* (a cotton skirt reaching from the waist to the ankles), *patuka* (a long sash measuring about 1 yard by 5 yards which is wound around the waist and used for carrying objects), and a *khasto* (a shawl covering the head and shoulder in cold weather).

Rarely does she wear rings or jewelry in her nose, but almost always she has brightly colored beads (*mugakomala*) around her neck. These beads may be of glass, limestone coral, mother-of-pearl, seeds of trees, or turquoise found in the high rocks.

Her hair is usually worn long or braided in pigtails. If a woman is married or unmarried, she will wear a *dhago*, a red cloth bow at the end of the hair braid, and if she is a widow, a black cloth bow. Absence of the *dhago* or the wearing of a white bow may betray a defamed woman. Women who have visited Kathmandu and are of somewhat better financial status than the typical village woman may sometimes wear saris.

The typical dress of the Nepalese man is the *surwal* (tight-fitting trousers somewhat like jodhpurs), *daura* (a long shirt worn outside the *surwal*, *gaffu* (a hip-length wool felt coat with short sleeves), and *dhoti* (a long sash wound around the waist over the *daura*). A *khukuri* (dagger-like knife) is tucked in his sash. No firearms were observed, either on the person or in the home. The man either goes bareheaded or wears a topee, trapezoidal in shape and made of cloth or withy. Cloth for all garments is usually black cotton brought in from Tibet. The *gaffu* is made from goat-hairs which have been pulled manually from the goat's belly so that the animal can still keep itself warm, too. Both men and women seldom wear shoes. The man usually goes barefoot even in wintertime, but some wear leather boots like the Bhotias farther east.

How the People Live

Malemchigāon is not even a dot on the map. Its 200 men, women, and children live in 25 thick-walled stone houses set on a small plateau extending from a steep mountain of 12,000 feet. The plateau is grass-covered, but the neighboring forest is thick with oak, bamboos, firs, and vines. Wild animals abound in the forest, and the villagers complain most vehemently about the depredations they suffer from nightly raids on their domestic stock and garden crops. Tarke Ghyāng, much more populous than Malemchigāon, has 600 people and 100 houses. It is not difficult to imagine that the hill people are quite warm and cozy when the winter snows come, for firewood is plentiful.

The homes the Sherpas live in resemble Swiss chalets. They are well-built, 2-story stone

The temple at Tarke Ghyāng where the second clinic was held. A monk poses with Dr. G. T. Brooks, the entomologist who accompanied Dr. Moore.

dwellings. On the ground floor, a family's animals may sleep during cold weather. The upper floor, reserved for the family, is designed for comfort.

The rooms are L-shaped with wooden floors and elaborately carved wood walls adorned with shelves and cupboards. On the base of the L is a raised platform built for sleeping. Three open but shuttered windows are directly over the platform. Nearby, a clay pit contains the fire. Above the pit is a crude chimney, not typical of the other small village houses observed in Nepal, which conveys the smoke out of the room. On a porch at the other end of the room an opening has been made to serve as a privy.

At Malemchigāon, the houses are nicely laid out with at least 30 feet between each dwelling. Wheat had been sowed between the buildings and looked a fresh golden brown in June. The cattle were herded on a pasture away from the village, and the children played in the sunshine. Each house was clean and neat.

The houses in Tarke Ghyāng are constructed like those of Malemchigāon but are built so close together that the roofs almost touch, giving the village an appearance of poverty and overcrowding not unlike some of the slum areas in our North American cities. Cows roam the alleys in the mud. Children play in the dung and grime. Unlike the people of Malemchigāon whose hard work and cooperative struggle for existence were exhibited in their cleanliness and good spirit, the villagers of Tarke Ghyāng showed no real spirit of cooperation and failed to concern themselves with the communal advantages to be gained from good pastures and well-tilled crops.

Each house in the district has an ample stock of brass cooking utensils, glasses, and serving dishes, all neatly arranged and clean-looking on the shelves. Almost all food is cooked thoroughly, but eating is done with hands which are seldom clean.

The Sherpas are pure Buddhist and eat many kinds of meat. The main dietary substances are dairy products since their *chauris* yield large quantities of milk, cheese, butter, and whey. The villagers also produce and consume wheat, potatoes, corn, barley, beans, and eggs. They often go into the nearby forests to gather edible bamboo shoots. Their domestic cattle, the *chauris*, are a hybrid—yak bred with domestic cows. In the United States where the hybrid has been introduced in western areas because of its hardiness, the breed is called cattle-yak.

Water is derived from a glacier and from several springs above the villages. In Nepali, "khola" means "river." The stream tumbling down over the rocks, Malemchi Khola, passes close to the villages. It is clear and cold. The Sherpas seldom bathe because of the cold atmosphere in their environment, although steaming jungles are not too far away. Probably not more than one bath a year is taken in water. The Sherpas report, however, that they clean their skins with oil, about once a week.

Sewage Disposal Practices

Sanitary practices following elimination vary in the Helembu district from almost all others in Nepal—and from most all others throughout the Western World. Instead of using a lota filled with water, the Sherpas clean themselves with a stick and stone. Indeed, this method is quite sanitary, and the self-hygiene habits of the Sherpas are much cleanlier ones than those of the neighboring Terai people, for example, who are the least sanitary people in Nepal and yet only 50 miles away from the Sherpa tribes. The Tamangs, who are neighboring tribes too

but who live at lower altitudes, vary in this habit.

The Sherpas' fecal deposits are hauled away from the villages and are dumped either in the ravines or in their gardens for use as fertilizer. Like some other Asiatic people, they seem to prefer human to bovine excreta for agricultural uses, although bovine excreta may easily be collected from the droppings of their *chauris*. The practice of using human excreta for fertilizer (nightsoil) is common in other parts of Nepal where cowdung is used for fuel. It was therefore particularly strange to see huge piles of cowdung conveniently heaped alongside the Sherpa villages but going to waste. Some of the manure piles were obviously years old.

Many people in the villages had already heard about and put into use the new practice of making slit trenches which had been introduced earlier at Bodnath in the Nepal Valley. The practice was first demonstrated in Malemchigāon by a highly intelligent youthful leader, Phukten, the son of the Chinia Lama, who himself is educated and well-read.

The Village Leaders

The Chinia Lama is the moral, spiritual, and political leader of most Buddhists in Nepal, and, of course, in the area of Helembu, and, supposedly, in part of Tibet. He can speak 32 languages, including English, Chinese, Burmese, Japanese, and the dialects of Nepal.

The chief lama is the mayor or administrator and political leader as well as the priest and religious leader of the village. He owns most of the land and collects the small amount of taxes which are assessed each year. He does not live the orthodox life of his fellow lamas, who may live either in monasteries or in private dwellings and to whom is delegated the task of religious instruction.

The lamas are most cordial and democratic, mixing with their people and doing heavy work. They are actually one of their people in mind and thought. At Tarke Ghyāng, a Buddhist convent of 40 monks and nuns maintains the spiritual life of the people and assists the chief lama in administering the village's problems. The monks and nuns seem to be a part of the village and servants of the community. Nuns were seen tending small children and doing menial chores for the villagers.

The definition of lama is not clear. To the people of the Helembu, lamas are either priests or monks. But the Nepalese from Kathmandu, usually one who is a Hindu, thinks of all Tibetans as being lamas; he also thinks that the lamas of the Helembu belong to the same Buddhist sect as the Tibetans. A monk is a lama who has taken the robe and professed his willingness to lead a life of the spirit. Unfortunately, our conception of these terms is obscured by language differences and by unfamiliarity with exotic societies.

Social Customs of the Sherpas

Family life in the Helembu district seemed essentially quite intact. The people are free to make their choice in marriage, usually marrying at 14–16 years of age. The sons are encouraged to make their own homes and their own decisions. If a son is somewhat slow in choosing his wife, the family may take the initiative. Divorce is permitted, and if the wife has children, she usually receives half the property. Divorced women may remarry without social restraint.

Prostitution is not practiced. Promiscuity is actually low, contrary to the popular opinion held in the Nepal Valley. (Perhaps this stigma of promiscuous women in the district stems from legends of earlier times about wives who upon their return to the drab Sherpa villages from the glitter of the Ranas' court revolted against the contrasting austerity.)

There are no schools. Almost all the villagers are illiterate, or nearly so. Only a few understand Nepali, for their own dialect is Tibetan-like. It has no written form. Five percent of the people including the lamas are literate in Tibetan, and one percent are literate in Nepali.

The nearest medical facilities are at the capital, Kathmandu. There is neither a hospital nor a physician in the mountain area. When someone is ill, a *dhami* (drummer) is called in. Occasionally, herbs are used in curing an illness. The dead are cremated.

Setting Up the Clinics

Before holding the clinics in the two villages, the FOA team presented its credentials from the Nepal Government to the son of the Chinia Lama at Malemchigāon. The public health officer set up his one-man clinic for the sick, and the entomologist made a house-to-house canvass, offering DDT dust for lice and DDT residual spray to destroy the insects within the homes he was permitted to enter.

The team intended to put on a grand carnival for the Sherpas—some 600 people and 50 dogs made up the audience—and its two members came well-equipped for the job, despite the ardors of the expedition. They played recordings of the speeches of General Shumsher Jung Bahadur Rana, the Nepalese counselor of education at the time of the health surveys, and Dr. Jit Singh Malla, the director-general of health for Nepal, and showed health filmstrips lent for the purpose by the American Library in Kathmandu. They used a kerosene-operated filmstrip projector.

More than anything else, probably because of the snow scenes with which they could identify themselves, these villagers enjoyed "Winter on the Farm," one of the library's few health filmstrips. The villagers reciprocated with their own gestures of friendship, appreciation, and hospitality—showering their guests with gifts of eggs, butter, cheese, milk, jerked venison, and potatoes; entertaining with festive songs and gay dances; and generously offering *raksi* (rice and barley wine) and Tibetan tea (a combination of butter and tannic acid).

The surveys were completed in about 24 hours in Malemchigāon. The clinic in Tarke Ghyāng was delayed a full day by the funeral of the chief lama's brother, who had died after a 6-day illness, apparently of a simple infection, only the day before. After the funeral ceremony, the clinic, the DDT, the cinema, and the recordings were received with the same friendly enthusiasm exhibited at Malemchigāon.

In Tarke Ghyāng, the clinic was set up in the Buddhist temple, in a room without furniture but whose walls were decorated with delicate murals in the Japanese style depicting the gods' struggle against evil. The medical officer sat on a step opposite his patient who faced him, seated on a wooden box. Alongside, were placed the drugs and instruments. Sterile technique was necessarily limited. Instruments were sterilized by swabbing with iodine after washing, and needles were kept in Zephiran solution.

Patients were given slips of paper numbered according to how many people the medical officer could see during the clinic which operated between 8 a.m. and 6 p.m. The pace was rapid. Only the most ill were given numbered slips in advance of the sesssion so that the merely curious could be eliminated from the lineup. When injections had to be given, the patient was taken into an adjoining room under the huge brass prayer wheel (12 feet high and 6 feet wide) where at least some privacy existed.

More women than men came for treatment. The women were not at all shy and soon learned that complete examinations were necessary if they were to receive proper diagnosis and medical aid. Few of either sex were older than 50. A man of 45 would exhibit the physique, appearance, and cardiocirculatory system of a North American of 65. The best preserved people examined were the monks and nuns.

In asking patients their symptoms, the medical officer relied on Indra Bir Pande, one of the interpreters who had accompanied the FOA team along the trip up from the capital valley. The other interpreter, Bhuban Raj Tuladhar, accompanied the entomologist from house to house in the dusting and spraying demonstrations. One of these interpreters had been on many European climbing ventures. It was necessary to translate the Tibetan-like dialect into Nepali and then to translate Nepali into English.

Actually, the lamas or the young, beautiful girls who had spent some time in Kathmandu were the ones who translated Tibetan into Nepali. On their return to the district, these girls became community leaders, commanding certain authority as well.

Of necessity, rather stereotyped questions were devised to extract the individual case histories. The chief interpreter kept a written record of the patients examined and of the diagnoses made. The diagnoses were spelled out for him letter by letter, in English. He had

learned the questions by rote. He would ask, "Do you have pain? Point to it. How long have you had it? Do you have fever? When?" In little time, the health officer would have enough information to proceed on his own merits.

There may be some criticism as to the efficiency of diagnosis and treatment, but the original purpose of the surveys was to obtain the basic data for a health program. Each patient was given the best possible treatment under the circumstances. Treatments were necessarily simple and adapted to the patient's comprehension.

Fevers were diagnosed by pulse and palpation. Asthmas and pneumonias were so pronounced that they could often be diagnosed in a minute. A diagnosis for tuberculosis depended on irregular fever, weight loss, rales in the chest, chronic cough over a 6-week period, typical sputum, and severe anemia. Diagnosis for amebic hepatitis was based on chronic dysentery, mucus and blood in the stool, weight loss, abdominal tenderness, and an enlarged tender liver. Intestinal parasites were diagnosed by the description given of the parasite found in the stool.

The Major Health Problems

The most common health problems of the Sherpa villages in order of magnitude are shown in table 1. The work of the clinics and the conditions treated in Malemchigāon and Tarke Ghyāng are shown in tables 2 and 3. Some data on the prevalence of goiter and malaria are shown in table 4.

All diagnoses listed represent the major presenting type of illness. For example, "tuberculosis" in the tables includes both advanced and far-advanced tuberculosis. Trachoma includes chronic trachoma and its sequelae. Massive goiter refers to colloid goiter. Osteoarthritis includes hyperarthritis and senile and traumatic arthritis. Upper respiratory infection refers to common colds. Wounds from *khukuri* slashes are listed separately since there were so many patients with this injury. The bear bite (table 2) was on the scalp; the teeth marks indicated that the man's head actually had been in the jaws of the beast.

In questioning the people about epidemics of disease, there was no suggestion that typhoid occurred in this area. Typhus seemed to be endemic. Two men died from typhus in the winter of 1953. Smallpox and plague are also unknown in this area. Smallpox is rampant in the lower areas of Nepal among the young and old Nepalese. A goddess of smallpox, Śītalā, is worshiped in many Hindu temples. Bacillary dysentery, smallpox, and plague could very well become serious diseases in Helembu, but fortunately no carrier had penetrated into this isolated region.

Table 1. Ten principal diseases treated at Malemchigāon and Tarke Ghyāng, Nepal, June 1953

Disease	Number of cases	Percentage
Intestinal parasites [1]	59	33. 7
Respiratory diseases [2]	23	13. 1
Arthritis [3]	20	11. 4
Eye diseases [4]	19	10. 9
Venereal diseases [5]	16	9. 1
Massive goiter	14	8. 0
Tuberculosis	10	5. 7
Chronic malaria	5	2. 8
Peptic ulcer	5	2. 8
Bacillary dysentery	4	2. 3
Total	175	99. 9

Includes: [1] Amebiasis, ascariasis, and trichuriasis. [2] Rheumatic fever, common cold, mumps, poliomyelitis, pneumonia, influenza, bronchiectasis, sinusitis, tonsillitis, and bronchitis, but not tuberculosis. [3] Specific and nonspecific arthritides. [4] Acute and chronic eye conditions. [5] All venereal diseases and complications.

The cold climate is a further factor retarding the spread of infectious disease to the Sherpa villages. Like the other tribes in the hills, the Sherpas rarely intermingle. Travel to the villages from Kathmandu is a rigorous 5 to 7 days' journey so that many ill persons going to the district from the capital probably succumb along the way.

Intestinal parasites are by far the greatest menace to health in these villages, and the ameba is the most common parasite. Other parasitic diseases are ascariasis and trichuriasis. Cases of these are frequent the year around, and these diseases are most prevalent during the monsoons. As the water was found to be essentially unpolluted, presumably these diseases are foodborne.

The use of nightsoil as fertilizer in addition to the noticeable uncleanliness of the hands—all eating was done with the fingers—and the unsanitary methods of food prepartion contribute to the high prevalence of these diseases.

Ascariasis is generally considered a problem of mountainous areas, and this is borne out in Nepal. Crowding, poor sanitation, and lack of medical care promote the spread and intensity of infection. Here again, the family provides the greatest source of spread. The statistics collected in these surveys are based on clinical observations and overwhelming infections, but, if stool specimens had been collected and examined, 90 percent of the population might have been found infected with amebiasis or ascariasis.

Methods of intestinal disease control might well focus on educational measures designed to teach the people food and milk sanitation, cleanliness, and the proper use of fertilizers.

In decreasing order of importance, the insect problems are those of lice, fleas, roaches, and flies. Flies are not prolific, however, because of the cold climate and the villagers' habit of depositing excreta away from their homes. There were no acute cases of malaria in the villages. The five patients with chronic malaria who were observed in the Malemchigāon clinic had contracted the disease while traveling through the Terai or through the malarious valleys of the hill area. There was no transmission of malaria per se in the Helembu villages.

Although the value of DDT was quite extensively advertised by the FOA team, the people at first did not take to the spraying and dusting operations: They could not associate the insects with their own pain and misery.

At Malemchigāon, occupants of only 8 of the 25 houses requested spraying—none was dusted. Even the lamas showed little interest in DDT. However, as the results of the spraying became known, and as the fame of DDT spread, the picture changed. At the Tarke Ghyāng clinic, 150 people were sprayed with 5-percent DDT, and a few more houses were sprayed there than in Malemchigāon. When the team was prepar-

The Goddess of Smallpox

The people of India appear to have realized at a very early stage of their civilization that faith is an important factor even in relief and immunity from bodily ailments. To them, in the absence of present day medical advances, this was even more important than it is to us today. In parts of India, therefore, legends have grown around deities who are credited with bringing relief to sufferers from certain diseases and images of them are kept in homes and in village shrines. But few take them seriously now. That of the goddess of smallpox is one of the most widespread.

Śītalā, the golden-complexioned, is regarded as the goddess of smallpox. She who sits upon a lotus leaf, all clad in red, with nimba leaves in her hand, is "the cool one." Her name is literally "She who makes cool."

During smallpox epidemics she is besought by anxious mothers. There are also appointed days for her worship, in different seasons, in different parts of the country. On these days one must not eat or drink anything hot, ostensibly, according to Underhill (The Hindu Religious Year, Calcutta, 1921), because she comes and rolls on the hearth and must not get burned. The real significance of this enjoinment is that no cooking should be done in the house so that no fire may have to be burnt and the house should remain cool and the patient immune from the effects of heat and fumes.

The goddess takes many forms; some say seven. That of Kalī, the black woman, who herself is a form of Durga, the wife of Siva, is one. Durga can take 14 forms.

In much of India, science competes with folklore and sometimes both are put to use simultaneously. Wilkins, in Hindu Mythology (Calcutta, 1882), says that although the Hindus are in the habit of inoculating their 2-year-old children in the spring of the year, gifts at the same time are presented to Śītalā and afterwards the flowers given her are placed in the child's hair as a charm. Offerings are made to Śītalā daily for those who have smallpox. If anyone is dangerously ill, he is placed in front of the goddess' image. Beggars go about with a partly gilded stone sacred to her and receive presents from the believers.

ing to leave Tarke Ghyāng, the once-disinterested chief lama requested that the remaining DDT dust be left with him to complete the job.

The Sherpas exhibited an amazing tolerance to the presence of these insects. Those few who ventured a DDT treatment could scarcely realize the miracle of being relieved of this nuisance.

Tuberculosis

Tuberculosis was seen at the clinic at Tarke Ghyāng where it is a definite problem, but there was no evidence of the disease in Malemchigāon. All types of tuberculosis were encountered in the clinic survey, and most cases were in active stages. The rate of advanced tuberculosis at Tarke Ghyāng is perhaps 15 per 1,000 population. Because of the overcrowding and the huddling of the houses in this village, the lack of sunlight and ventilation, a diet lacking in fresh vegetables and fruits, depletion of body reserves through infections and infestations, and the rigors of mountain life, most of these villagers are highly susceptible to tuberculosis. If the village is isolated or remote, contact with the tubercle bacillus is less likely. As an illustration (*1*), tuberculin skin-testing performed on mountain people at Darjeeling, the mountain station in West Bengal, India, indicated that the majority of the people living at high altitudes were tuberculin-negative, having never been exposed to tuberculosis. If an infected person from outside the snow-cap area were to contaminate the village, however, many, if not most, of the people could quite easily succumb to the disease. BCG vaccine might be indicated in these villages as well as an improvement in living conditions and isolation of sick cases.

Other Diseases

The large number of respiratory diseases observed, particularly those viral in nature, indicates the occasional contact with the outside world and the lack of resistance to infection. The cases of rheumatic fever are not surprising, therefore. Poliomyelitis, influenza, infectious mononucleosis, and viral hepatitis are endemic in the Helembu and elsewhere in Nepal, as has been observed in other clinical surveys. The cold nights and tropical days with great fluctuation in the atmospheric humidity tend to exhaust the respiratory mucosa. A tropical sun at high altitudes with its intense ultraviolet effects must play some part in reducing tissue reserves. In Kathmandu, respiratory infections are prevalent the year around. As many cases occur there in the summer as occur in the winter.

Goiter is prevalent, and people living in vil-

Table 2. 35 various diseases and conditions found among 63 Nepalese patients[1] at the Malemchigāon clinic held June 12, 1953

Conditions	Number of patients	Conditions	Number of patients
Amebiasis	19	Bear bite	1
Peptic ulcer	5	Acute gonorrhea	1
Osteoarthritis	4	Neurosyphilis	1
Ascariasis	4	Viral epididymitis	1
Trachoma	4	Gonococcal epididymitis	1
Massive goiter	3	Acromial fracture	1
Pelvic inflammatory disease	3	Gluteal wound (from cow-goring)	1
Khukuri (knife) wound	3	Chronic cholecystitis	1
Cataract	3	Fracture of vertebra T–7–8 (trauma)	1
Upper respiratory infection	2	Tuberculosis	1
Headache	2	Inflammatory (? gonococcal) arthritis	1
Anemia	2	Scalp burn	1
Impetigo contagiosa	2	Acne rosacea	1
Rheumatic heart disease	2	Lice	1
Bacillary dysentery	1	Influenza	1
Pneumonia	1	Scar contracture of elbow	1
Hypertension	1	Cuts on foot	1
Cardiovascular syphilis	1		

[1] Approximately equal distribution of sexes. All patients examined according to complaints only.

Table 3. 49 various diseases and conditions found among 105 Nepalese patients [1] at the Tarke Ghyāng clinic held June 14, 1953

Conditions	Number of patients	Conditions	Number of patients
Amebiasis	26	Sterility	1
Osteoarthritis	11	Cirrhosis of liver	1
Goiter	11	Ovarian tumor	1
Trachoma	9	Sinusitis	1
Ascariasis	9	Bronchial asthma	1
Chronic malaria	5	Thrombophlebitis	1
Pneumonia	5	Hemiplegia-cerebral vascular accident	1
Psychoneurosis	5	Lymphoma	1
Scrofula	3	Rectovaginal fistula	1
Tuberculosis	3	Bronchiectasis	1
Bacillary dysentery	3	Gonococcal arthritis	1
Cataract	3	Pelvic inflammatory disease	1
Lice	3	Headache	1
Rheumatic fever	3	Osteomyelitis	1
Tubercular adenitis	2	Ulnar paralysis	1
Typhus (?)	2	Anemia	1
Furunculosis	2	Influenza	1
Cut foot	2	Pediculosis	1
Poliomyelitis paralysis	2	Arteriosclerotic heart disease	1
Vitamin deficiency and malnutrition	2	Tertiary syphilis (cutaneous)	1
Neurosyphilis	2	Trichuriasis	1
Bronchitis	2	Leg sprain	1
Mentally defective	1	Lupus erythematosus	1
Clubfoot	1	Acute tonsillitis	1

[1] Approximately ⅔ were women; ⅓ men. All patients examined according to complaints only.

lages near Malemchigāon and Tarke Ghyāng were reported to be as high as 95-percent infected. Simple control methods, through the use of iodides, such as adding a measured amount of potassium iodide powder to the village salt supply, would effectively control the problem.

Venereal diseases were reported to be fairly common and were evident in the advanced stages. The large number of cases noted at the two clinics represents the accumulation of a period of about 10 to 20 years. There were actually 8 cases of venereal disease at Malemchigāon; 2 cases were found in children who showed corneal cicatrization, which was diagnosed as former ophthalmia neonatorum. At Tarke Ghyāng, eye cases were also included with venereal diseases when the origin seemed clear.

The villagers reported that no one had been ill with venereal diseases, acute gonorrhea, or genital lesions since 1950, when many people suffered all at once during an epidemic of venereal diseases in both villages. The return of a prodigal daughter to the village at that time may have been the origin for this outbreak. Serology tests, penicillin, and education would effectively control venereal diseases.

Arthritides in the form of traumatic osteoarthritis were quite common among both the men and women. Most cases were among still fairly young people; most of them were 35 to 50 years of age. The carrying of heavy loads weighing up to 100 pounds, day after day and up rocky trails, is undoubtedly the cause. The trail from Malemchi Khola, up the river, to Tarke Ghyāng was particularly steep and

Table 4. Some data on malaria and goiter prevalence in the villages of Malemchigāon and Tarke Ghyāng, Nepal, June 12, 1953

Surveys	Data
Spleen survey:	
Number of spleens examined [1]	27
Number of positives found with palpable enlargement	0
Goiter survey:	
Number of thyroid glands examined [2]	43
Number of glands found enlarged	[3] 23
Percentage of goiter in population	53

[1] Examinations made of children, both sexes, under 12. [2] Examinations made of men, women, and children over age 12. [3] 26 percent were male; 74 percent female.

rocky, and in places, the angle was more than 60°. Engineered mountain trails, the wearing of shoes, and lighter loads could contribute to improved health in this respect. Also, a little ingenuity could lead to the use of ropeways, wheels, and hydraulic lifts.

It seemed strange to make a tentative diagnosis of peptic ulcer in the district. Worry and frustration, however, need not be associated only with a high civilization—even a porter seems to have his problems of mind and psyche.

Goodwill and Good Health

A public health program in the mountain area would be effective, long-lasting, and economical in view of the simplicity of most of the disease problems encountered. A village development program extended to the Helembu would find these clever people eager and receptive toward quick progress in the betterment of their environment. Lanes of commerce might well be extended to the mountain areas.

The Sherpas, as an example of the hill tribes, have surpluses of milk, butter, cheese, and whey, which, it is believed, they would willingly exchange for the cloth and salt so scarce in the Helembu. As these people feel that they are more Tibetan than Nepalese, a program of goodwill and help would assure their patronage southward toward the central valley.

REFERENCE

(*1*) Bates, L. E., Busk, T., and Palmer, C. E.: Research contributions of BCG vaccination programs. II. Tuberculin sensitivity at different altitudes of residence. Pub. Health Rep. 66: 1427–1441 (1951).

Conference on Needs of Migrants

Leaders in health, education, and welfare in 11 States on the eastern seaboard have been invited to attend a conference in Washington, D. C., May 17–19, 1954, to discuss needs of migrant families and their children. Invitations have been issued jointly by the Department of Health, Education, and Welfare through Martha M. Eliot, Chief of the Children's Bureau, Leonard A. Scheele, Surgeon General of the Public Health Service, and S. M. Brownell, Commissioner of Education. The Field Foundation is helping to meet conference expenses.

States which have been asked to send representatives are New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida, and Alabama. The governors of these States have been asked to support the conference. Also invited are representatives of the Federal Departments of Labor and Agriculture, as well as of national organizations with active programs for migrant families.

Enforced Legal Isolation Of Tuberculous Patients

By EDWARD KUPKA, M.D., M.P.H., and MARION R. KING, M.D.

The recalcitrant tuberculosis victim always has been a thorny problem for officials charged with the conduct of tuberculosis control programs. Enforced isolation of such persons is an extremely controversial procedure. This report of California's experience is presented in the belief that it will stimulate discussion and in the hope that it will evoke comparisons with other experiments to protect the public from unnecessary exposure to infectious victims of tuberculosis.

PUBLIC HEALTH departments have long been faced with the problem of how to control tuberculous individuals who will not cooperate in isolating themselves from healthy people and who persistently continue to endanger family and community. Twenty-two States (*1*) have compulsory isolation laws, but half of these States do not make an effort to enforce them. Thus, while legal means of restricting the careless person with tuberculosis are available, in many places there has been reluctance to apply the checkrein of force. Also, the lack of even enough beds for those willing to enter a sanatorium plus the unwillingness of some sanatorium directors to admit uncooperative tuberculous individuals has placed obstacles in the way of forced hospitalization.

In some locations, the problem has been grappled with directly by establishing additional enabling regulations, usually on a local

Dr. Kupka is presently assigned as public health officer to the Foreign Operations Administration Mission at Hanoi, Vietnam. He is on leave for 2 years from the post he has held since 1942 as chief of the bureau of tuberculosis control, California State Department of Public Health. Dr. Kupka was formerly a tuberculosis clinician, medical director of several tuberculosis sanatoriums, and a general practitioner of medicine. In 1952, he spent 4 months as tuberculosis controller in American Samoa.

Dr. King, since January 1950, has been superintendent of the California Medical Facility located at Terminal Island, San Pedro, and operated by the California State Department of Corrections. Prior to his retirement from the Regular Corps of the Public Health Service in 1950, Dr. King served as medical director, Bureau of Prisons, Department of Justice, Washington, D. C.; as warden and chief medical officer, Medical Center for Federal Prisoners, Springfield, Mo.; and as chief medical officer at the United States Penitentiary, Leavenworth, Kans.

level, and by creating special guarded facilities for persons committed to the institutions by the counties. Columbus, Ohio (*2*), Milwaukee (*3*), Seattle (*4*), Los Angeles County, Calif. (*5*), and Philadelphia have each borne down upon the uncooperative tuberculous patients and have created practical plans of action for handling uncooperative persons with tuberculosis.

Los Angeles County's Experience

In California, the Los Angeles County Health Department pioneered in trying to bring the careless and the recalcitrant tuberculous patient under control. The first isolation order was issued in 1931. The program was pursued so energetically that in the first 10 years 800 suspects were examined under legal order, and 500 with active tuberculosis were subjected to compulsory legal isolation in institutions. More than 100 arrests and convictions attended these efforts.

There are, however, no reported decisions of the California Superior Courts and no decisions of the District Courts of Appeals or the Supreme Court of California concerning the legality of the program of enforced isolation of tuberculous patients, although there have been a number of venereal disease cases in which the courts upheld the right of health officers to quarantine a person when the health officer had reasonable cause to believe such person has a contagious or infectious disease. The most recent of these cases are *Ex parte Martin*, 83 Cal. App. 2d 164, 188 P. 2d 287; *Ex parte King*, 128 Cal. App. 27, 16 P. 2d 694; *Ex parte Clemente*, 61 Cal. App. 666, 215 P. 698; *Ex parte Arata*, 52 Cal. App. 380, 198 P. 814; and *Ex parte Johnston*, 40 Cal. App. 242, 180 P. 644. In the *Arata* case, it was found that the health officer must have reasonable cause for belief that the person is infected and may not act upon mere suspicion, and in the *Martin* case, that the county jail is an appropriate place for detention of a person whom the health officer has reasonable cause to believe infected.

In early 1943, the California State Department of Public Health called together a group of health officers, sanatorium directors, tuberculosis specialists, and representatives of the State attorney general's office and of the California Tuberculosis Association. During the conference (*6*), the subject was thoroughly discussed from the viewpoint of each discipline represented, and it was generally concluded that:

The experience in Los Angeles County has shown the practicability of enforced isolation of the tuberculous individual.

The local health officer is authorized to quarantine or isolate a person with communicable tuberculosis and may do so without consultation with or direction from the State health department.

The local health officer must be prudent in the selection of suitable cases for coercive action and must be able to show that reasonable cause exists.

Enforced isolation is to be resorted to only after persuasion and explanation have been thoroughly attempted.

A person who breaks tuberculosis isolation is guilty of a misdemeanor, for which he can and should be prosecuted.

Recalcitrant tuberculous patients frequently present complicating factors such as chronic alcoholism or borderline psychosis.

A campaign of education on the occasional necessity of enforced tuberculosis isolation is in order.

During the 1943 annual meeting of the California Tuberculosis Association, a session was devoted to the problem of recalcitrant tuberculous patients. Papers were presented (*7*) which outlined the historical, legal, and procedural aspects of the problem. The speakers were in agreement as to the necessity of action, even though they recognized the difficulties involved.

In spite of these two conferences, and the wide distribution throughout California of the proceedings of both, little progress was made in persuading other counties to follow the lead of Los Angeles County. Most local jails were unable properly to isolate a tuberculous prisoner. None of the sanatoriums had security

wards which were escape-proof. The State law was worded diffusely, merely blanketing tuberculosis with many other communicable diseases and setting the penalty for "disobeying the health officer," rather than specifically for breaking tuberculosis isolation.

In some quarters, efforts were made to promote the establishment of a State tuberculosis sanatorium, which, in addition to other categories of patients, could also care for the committed recalcitrant in specially planned wards. But the existence of a satisfactory chain of county-owned sanatoriums, partly State-supported, and other factors defeated the proposal.

In 1948, the California Conference of Local Health Officers, which is a consultative and advisory body to the State department of public health, requested that legislation be introduced to create a State facility for tuberculous recalcitrants which would take committed persons from smaller counties, particularly where even one florid recalcitrant patient could negate much of the effectiveness of a tuberculosis control program.

Acting on this request, the State public health department prepared a bill that was passed without debate by the legislature, becoming law in late 1949. This act empowered the State department of public health to "lease" facilities, and money was provided for this purpose. At the same legislative session, two sections (*8*) which set up procedures and penalties specifically for the enforcement of tuberculosis isolation were added to the California Health and Safety Code. These were drawn up especially to smooth the way of the local health officer who would need to send patients to the proposed facility for recalcitrants.

Sections 2559.5 and 2600.5 of the revised code (*8*) make it mandatory for the local health officer to issue a quarantine and isolation order in writing when he determines that segregation of any patient afflicted with infectious tuberculosis is necessary for the preservation of the public health. The local health officer is also required to advise the district attorney of the county, in writing, when the order of quarantine and violation has been violated. Any patient found guilty of violating the order is guilty of a misdemeanor, and upon conviction, may be ordered by any court of local jurisdiction to be confined for a period up to 12 months on a subsequent conviction.

A Temporary Medical Facility

In California, which has almost 80 tuberculosis institutions, it would seem to be an easy task to find an institution which would be willing and able to set aside a wing, a floor, or a building, to put such area under proper security arrangements, and then lease it to the State public health department. But it proved to be otherwise. Most of the institutions were overcrowded; many had waiting lists; and almost nowhere was there enough bed space available. One of the larger sanatoriums, which was located after much seeking, offered an older isolated building on condition that the State health department recondition it in a major way and make all the security arrangements. However, relative remoteness made the location somewhat less than ideal, and before the negotiations had crystallized, it was learned that the California State Department of Corrections might be able to help.

During the early period of California prison history, almost 100 years ago, it was customary for each institution to care for its own tuberculous patients. At first, this practice affected only San Quentin, since for a long time it was the only prison in California. Later, as the number of prisons was increased, efforts were made to segregate patients in a single prison only. At times, the prison would be San Quentin, and at others it was Folsom.

A significant reorganization of California prisons began in 1944 when the Governor appointed Richard A. McGee to the newly created position of director of corrections. Since then, the California State Department of Corrections has been actively concerned with the establishment of a classified correctional program (*9*) involving, among other things, a diversification of institutions to meet the needs of offenders. Recognized and approved at an early date was the urgent need for an adequate facility for treatment of the many disabled inmates, particularly those afflicted with long-lasting physical and mental illnesses. The basic justifications for such an institution have not

been seriously questioned at any time. Construction of such a treatment facility is now under way on a site of some 900 acres near Vacaville, Calif.

In the meantime, the former Navy Disciplinary Barracks at Terminal Island, San Pedro, Calif., was loaned to the department of corrections in 1950 and is being used as a temporary California Medical Facility. During 1938, it had been opened for use by the Federal Bureau of Prisons as a correctional institution for short-term, medium-custody inmates, and some 4 years later it was transferred to the Navy.

Although the temporary medical facility is not a regular hospital, efforts are being made to meet the basic standards. It really serves as an intermediate type of institution halfway between a prison and a hospital. One thousand and one hundred inmates are cared for by an average number of 200 employees. According to three major medical categories of disabilities, the current population is 150 tuberculous, 400 chronic infirm (including the aged), and 550 neuropsychiatric patients.

When the California State Department of Public Health became aware of the plans to care for tuberculous felons at Terminal Island, the thought grew that here might be the facility to care for the tuberculous recalcitrants. The State department of corrections was sympathetic to the idea and plans were accordingly made to receive both types of tuberculous individuals—felons and recalcitrants. The tuberculous felons were transferred to Terminal Island from other institutions, particularly from Folsom Prison, during the summer of 1950. They were a large group, approximately 90, and because of the obvious difficulties involved in properly segregating and treating so many patients with tuberculosis in the regular institutions, it was decided at the outset to give them transfer priority over other patients. Subsequently, active cases detected in the regular prison population and more recently in the reception and guidance centers have also been promptly transferred to Terminal Island. Many of these are discovered by routine admission X-ray films; others are found by the periodic small-film surveys made by the California State Bureau of Tuberculosis Control.

A section of the tuberculosis building was made ready for the reception of tuberculous misdemeanants. The first misdemeanant, one from Santa Clara County, was admitted in December 1950. The 25 beds available were rapidly filled from counties in all parts of the State.

According to the present agreement between the State departments of public health and corrections, the number of misdemeanants at Terminal Island shall not exceed 25 at any one time; and they shall receive no more or no less treatment than other patients, but shall be separated as much as possible from other types of patients. Since the medical facility is a unit of the department of corrections, there is an interchange of State prisoners between it and other penal institutions in California, and it is governed by the same general laws and rules as the others.

No significant questions have been raised concerning the legal rights or privileges of the felons or regular State prisoners. Procedures relating to segregation, reporting of active cases, and other matters were well established long before the temporary California Medical Facility came into being. But questions were soon raised concerning the status of the group committed for breaking tuberculosis isolation—the recalcitrant misdemeanants.

Legality of Enforced Isolation

The evident intent of the provision (*8*) in the health and safety code which authorizes the State department of public health to lease any facilities it considers necessary to care for such misdemeanants (section 3300.4) is to authorize confinement when necessary in a place other than a county jail.

According to section 17 of the California Penal Code, "A felony is a crime which is punishable by death or by imprisonment in the state prison. Every other crime is a misdemeanor. . . ."

It was inevitable that the legality of the public health department's selecting the Terminal Island medical facility as a place for the incarceration of recalcitrant tuberculous patients would be questioned. Is it legal to confine misdemeanants in a specialized institution

established for the treatment of felons? An opinion was requested of the State attorney general regarding this matter. He responded in August 1951 in part as follows (*10*):

"The fact that, traditionally, misdemeanants are not confined in State prisons does not necessarily or legally prohibit such confinement. The fact that the legislature has by statute directed the State Department of Public Health to select and obtain facilities it deems necessary to care for recalcitrant persons infected with active contagious tuberculosis who are convicted of violation of Section 2600.5 of the Health and Safety Code, would appear to make such confinement legal by courts which have misdemeanor jurisdiction. This is particularly true where, as here, we are concerned with recalcitrant active contagious tuberculosis patients and such confinement is necessary to protect the public from infection. The average hospital is incapable of furnishing the necessary restraint or guards for such patients, and county jails are inappropriate places for treatment. The fact that the place selected by the State Department of Public Health is a part of the State prison system would appear to be immaterial."

The attorney general concluded:

"Judges of Justices' Courts, both Class A and B, and of Municipal Courts have the power and authority, under Sections 2600.5 and 3300.4 of the Health and Safety Code to commit recalcitrant tuberculosis patients for violations of Section 2600.5 of the Health and Safety Code, to the Terminal Island Medical Facility."

Pertinent Sections of the California Health and Safety Code Which Apply to Enforced Legal Isolation of Tuberculous Patients

2554 Directs health officers and coroners to take necessary measures to prevent the spread of contagious and infectious diseases, including, among others, tuberculosis.

2559.5 Directs local health officers to use every available means to ascertain the existence of and to investigate all reported and suspected cases of infectious tuberculosis; and authorizes isolation and quarantine of persons suspected to be infected, the service of notice of quarantine upon such persons, and in case of violation of quarantine, notification of such violation to the district attorney.

2562 Requires obedience to the health officer's orders in cases of quarantine.

2563 Requires a quarantined person to remain on the premises.

2600 Provides that violation of any State department rule, order, or regulation respecting quarantine is a misdemeanor.

2600.5 Provides that any person who fails to comply with the health officer's order concerning his isolation is guilty of a misdemeanor, and upon conviction may be ordered by the court confined for not more than 6 months.

2600.6 Provides a 12-month sentence for violators who are repeaters.

2601 Provides that willful exposure of self or another to a communicable disease is a misdemeanor.

2602 Provides the penalty for violation of Section 2601.

2603 Requires the district attorney to prosecute in the case of a violation of sections 2559.5 and 2600.5.

3300.4 Authorizes the State department of public health to lease facilities necessary for the care of tuberculous misdemeanants.

3300.46 Makes it mandatory for the local sheriff's office to transport tuberculous misdemeanants to and from the facilities leased by the State health department for their care.

Problems in Maintaining Isolation

In the face of great need for space in all the penal institutions and the necessity of making maximum use of all available beds, there is seldom any margin or reserve for flexibility within the Terminal Island institution. This is an unfavorable situation, which at times has caused considerable annoyance.

On arrival at the medical facility, the patients are assigned immediately to the tuberculosis section and placed in single cells, if available, pending classification. Such medical treatment as appears to be indicated is begun without delay. The classification procedure is based on the standard method prescribed by the State department of corrections but with emphasis on the clinical factors.

While the effort is made to keep the two types of tuberculous prisoners apart, the physical limitation of the wards and lack of flexibility have proved to be an obstacle which unfortunately cannot be fully overcome until the patients can be transferred to the new institution at Vacaville. Generally, the misdemeanants are accommodated in single cells. Those in both categories who are more critically ill are also kept in single cells.

Twenty years ago, prison tuberculosis wards consisted largely of toxic, bedfast men with limited life expectancy. Today, the tuberculosis section of the California Medical Facility consists largely of ambulatory patients with a promising expectation of life, even though the disease is usually moderately or far advanced. This change is at least partly due to the use of modern drugs which, while they do not always produce miracles with respect to cure, certainly prolong life. Most of the recalcitrant tuberlous group have a fibroid type of disease which remains clinically nonprogressive under favorable conditions with occasional relapse under adverse conditions.

That tuberculosis is frequently superimposed on other disabilities is another significant problem which often is given insufficient attention. Minor mental disorders are exceedingly prevalent, at times reaching psychotic proportions. The misdemeanants, of course, bring their inner conflicts, anxieties, and other troubles with them, all in addition to tuberculosis. Many are chronic alcoholics who have been arrested and jailed numerous times; a few have used narcotic drugs. Many of them suffer from the loneliness and the boredom of the situation in which they find themselves. Some feel guilty, inhibited, and depressed. Others are convinced that the world in general is wrong and the institution especially is wrong and that they are justified in doing as they please.

So, in addition to medical and surgical measures, it is necessary, both from an administrative and scientific point of view, to prevent the development or worsening of psychological deviations and to do something about them as they are detected, for often they are the cause of more difficulty than the tuberculosis per se. To combat the tension, restlessness, hostility, worries and fears, a group psychotherapy program has been made available to the patients in the tuberculosis section. Other auxiliary services are also brought to bear on the problem—education, religion, occupational therapy, social service, bibliotherapy, and hobby work. These and allied services are essential for the peace and health of mind of the average man who is segregated and restricted for a prolonged period of time, whether for a criminal offense, tuberculosis hospitalization, or both.

Administrative Difficulties

The medical staffing is adequate. In residence is a full-time physician who for one afternoon a week is assisted by a visiting tuberculosis specialist. A visiting thoracic surgeon assisted by the resident surgeon devotes a half day each week either to review cases proposed for surgery or to operate. Because of the active medical and surgical therapy, some of the recalcitrant group have left after the relatively short term with a negative sputum for the first time in many years.

The physicians of the State bureau of tuberculosis control act as consultants to the facility and visit the patients periodically. When a tuberculous prisoner is discharged, whether a recalcitrant or a felon, a summary of treatment and status is sent to the health officer of the originating county to which the patient is returned. Basic data concerning the facts pre-

ceding commitment of the recalcitrants and their medical course during residence are forwarded to the bureau of tuberculosis control.

Transportation of the misdemeanants to and from the facility presented difficulties at times. Some sheriffs' offices, failing to find specific instructions in the penal or health and safety codes, refused to go out of the county with a misdemeanant. Others pleaded lack of funds for this specific purpose. However, transportation was ultimately arranged in most areas. Two patients had to be discharged without transportation because the home county would not come for them. They had to be released temporarily into the custody of the Los Angeles City Health Department, which provided hospitalization while other transportation could be arranged. In the spring of 1953, the California Legislature passed an act (*8*) making it mandatory for the local sheriff's office to transport patients to and from the facility (Health and Safety Code, sec. 3300.46).

Other legislation (*8*) passed at the same time permits a maximum of 12 months on a second or subsequent commitment to the facility (Health and Safety Code, sec. 2600.6). This may act in a twofold way, permitting a longer segregation of the worst recidivists, and correspondingly longer protection for the community, but tying up some of the few beds and resulting in a smaller turnover of patients. The increase in beds hoped for at the new institution at Vacaville may help in expanding these services. As of mid-1953, 8 patients had been returned a second time, and 1 for a third time.

A local obstacle was presented by those county prosecuting attorneys and judges who were reluctant to send sick tuberculous patients to a prison. Circular letters were sent to all health officers, prosecuting attorneys, and local judges by the California State Department of Public Health and the attorney general's office, quoting and outlining the law and its procedures and reassuring them of the adequate nature of the medical treatment provided at the facility. The medical officers of the State bureau of tuberculosis control visited counties on occasion to assist health officers in persuading prosecuting attorneys who did not wish to take action. On the whole, whenever an adequate explanation was made to the legal fraternity, cooperation followed. The main point at issue was whether the right of the individual to be free in his movements was to override the community welfare. The judgment in this matter is left to the local health officer, with the judge of local jurisdiction making the decision regarding disposition.

It must be recognized that in practice only the worst of the recalcitrants in a community are ever presented to the prosecuting attorney for action. Only after all customary efforts to gain cooperation have repeatedly failed, and the patient in an obvious fashion continues to endanger the community, will the health officer finally take this legal step.

A Controversial Area

Any kind of a program in so controversial an area cannot hope to escape criticism. The one most frequently heard is that a prison is no place for an ill tuberculous person. This criticism has been met by emphasizing the danger to the community and by providing as good medical service as would be available elsewhere.

Some have objected that 6 months is too short a period for the isolation of most of the uncooperative tuberculous individuals, and that a more elastic law should be created permitting incarceration until the sputum is negative. The law permitting a 12 months' term for repeaters is a step in this direction. At times, lack of room has meant nonadmittance of a recalcitrant, to the understandable discomforture of the local health officer.

Some have objected to calling these patients "recalcitrants." They feel that the individuals are basically disturbed "psychopathic personalities," usually alcoholic addicts. That these individuals are also tuberculosis patients is a happenstance, they believe. They suggest that this type of patient be committed to a State mental hospital.

There is no denying that the majority of the group require more than a little psychiatric care. However, most of the recalcitrants are not "insane" and cannot legally be committed under present laws. Also, there is great overcrowding in the State hospitals. Then, too, the security arrangements should be tighter than

those currently available at State hospitals. Possibly in the future, a wing especially for this category of patient could be built at a designated State hospital. For the present, the new facility under construction at Vacaville should meet the situation satisfactorily.

Another criticism of considerable validity is that insufficient psychological services have been offered. Effort is being made to improve these services by increasing the amount of professional time that can be devoted to the misdemeanants. It is hoped eventually to provide a full-time specialist to work specifically with the misdemeanant group.

Paradoxically, two patients were so pleased with their treatment that they asked to be sent back. This not being possible, they deliberately broke their isolation orders in order to be committed again. The local authorities obliged in both cases. This episode is told not for its humorous implication, but to throw light on the mixed feeling on the part of some of the recalcitrants that the protected environment of a prison offers not only a psychological haven but one that assures proper physical treatment. This phenomenon has been noted by criminologists in other categories of law-breakers.

More than 100 patients have been received at the facility since it opened in December 1950. A followup review (*11*) was made of the first 27 patients who were discharged. As of November 1, 1952, 11 were properly isolated in local hospitals; 1 was isolated satisfactorily at home; 6, having become noninfectious, had been reclassified as arrested or inactive; 1 had died, and 8 were still infectious and not properly controlled. Some of the last group had dropped out of sight. While this speaks well of the immediate effects of the incarceration, it offers no guarantee against future misbehavior of the offenders.

There seems to be little call for similar beds for women who are tuberculous recalcitrants. During the 3 years of this program, only 2 requests to admit women were received. However, since the California Institution for Women is building an additional medical wing, 1 or 2 beds in it can be used for this purpose in the future.

In viewing this program from a 3-year perspective, it is evident that imperfections exist, that many thorny problems have arisen, and that some have not found solution. Most local health officers and sanatorium directors are in agreement with our view that in a State as large and populous as California, there is a need for a central facility for the reception of the seriously uncooperative tuberculous male patients, which will be available to all the counties in the State.

The pattern outlined here is one that has worked: It has found acceptance far beyond the meager number of beds available, so that it has been necessary to set up a quota for the larger counties. The California Medical Facility has spared the people of California from spread of tuberculosis by heavily infected individuals who had a contagious potential many times that of the average cooperative tuberculous person. The existence of the institution has given the health officer a specific weapon for the restriction of the very worst offender and is even more valuable as a threat than it is in use. Once it becomes known in the community that an individual has been defying the law in this respect despite repeated and futile efforts to convert him and that he has been sent to a State prison facility, the effect sometimes is very noticeable. The health officer now finds previous recalcitrants more willing to obey his orders or enter local tuberculosis institutions and remain there.

Of long-term results, it is too early to speak. In such a group, a large number will be recidivists. Some will reach arrestment of disease; some will attain personality rehabilitation. A few of the most heedless could justifiably be held under restriction for the remainder of their lives. In any event, however, the program will result in the reduction of the exposure of the public for a significant number of man-years, and it is helping the local health officers in one of their most difficult problem areas.

REFERENCES

(*1*) Institute of Public Affairs, University of Texas: Tabulation and summary of tuberculosis questionnaires. Austin, The University, 1950.

(*2*) Potts, W. L., and Goodloe, O. M.: Compulsory hospital isolation of the recalcitrant positive-sputum patient. Ohio State Med. J. 48: 25–31 (1952).

(3) Banyai, A. L., and Cadden, A. V.: Compulsory hospitalization of open cases of tuberculosis. Am. Rev. Tuberc. 50: 136–146 (1944).
(4) Northrup, C., Fountain, J., and Zahn, D.: The practical management of the recalcitrant tuberculous patient. Nat. Tuberc. A. Tr., 1952, p. 162.
(5) Telford, P. K., and Bogen, E.: Compulsory isolation for tuberculosis. Am. Rev. Tuberc. 45: 288–291 (1942).
(6) Kupa, E., Ed.: Conference on tuberculosis isolation. Los Angeles, California State Department of Public Health, 1943. (Out of print.)
(7) Compulsory hospitalization of recalcitrant tuberculous patients [four papers] California & Western Med. 59: 43–45 (by E. Kupka), 45–47 (by A. L. Martin), 47 (by J. O. Raffety), and 47–48 (by P. K. Telford) (July 1943).
(8) Deering's California State Health and Safety Code (Annotated): Sections 2559.5, 2600.5, 2600.6, 3300.4.
(9) McGee, R. A.: California builds a new prison system. State Government, July 1952, pp. 143–146.
(10) Opinion of the Attorney General of the State of California dated August 9, 1951 (Vol. 18 Op. Atty. Gen. p. 73).
(11) Bush, H. C.: California's program for control of recalcitrant TB patients. California's Health 10: 111–112 (1953).

each month in PHR

Technical . . . scientific . . . operational . . . discussion papers on a wide range of subjects—health administration, disease control and epidemiology, environmental health and sanitation, health statistics, laboratory and technical reports, occupational health and industrial hygiene, international health operations—papers of direct value to administrators, physicians, dentists, engineers, nurses, educators, and other members of the public health practice and research teams . . . plus notes on important scientific and governmental developments, and trends in morbidity and mortality, announcements of all new publications, films, and exhibits of the Public Health Service.

for your personal copy of PHR

use subscription blank on inside back cover

Tuberculosis Among College Students

Report on a 4-year case-finding and followup program at Florida State University

By THOMAS J. BROOKS, Jr., Ph.D., M.D.

AVAILABLE DATA on the incidence of tuberculosis in the general population as well as in various select groups represent at best only a minimum of the actual number of persons infected. On the basis of 3.5 million small roentgenograms of the chest made during 11 surveys from 1947–49 (*1*), "the overall incidence of pathologic changes suspected of being tuberculous was 2 to 5 percent." As might be anticipated, a greater number of active cases of the disease were found among older age groups.

It is only within recent years that the problem of this disease in college and university students has begun to receive the attention which it merits, and the data available to the present time are still very meager. In an attempt to determine the scope of activity in this field, the tuberculosis committee of the American College Health Association in 1952 submitted questionnaires to 1,068 colleges and universities requesting information as to whether or not some kind of tuberculosis control program was in effect. Replies were received from 672 of the institutions, of which 548 (81.5 percent) indicated that they did have some type of control program.

Dr. Brooks is professor of preventive medicine and chairman of the department of preventive medicine and public health at the University of Mississippi School of Medicine. Until recently, he was medical director of the university's hospital, Florida State University, and earlier he had been director of the department of parasitology at the Bowman Gray Medical School at Winston-Salem, N. C., and a teaching fellow at the University of North Carolina School of Public Health.

Ohio State and Other Studies

In the 13th annual report of the University of Virginia Department of Student Health for 1950–51, it is aptly stated that "the disclosed incidence of active tuberculosis in college groups (with its accompanying infectiousness and public danger) has been shown to be directly proportional to the thoroughness of appropriate diagnostic surveys." Dr. William T. Palchanis has undertaken an extensive 5-year study of this disease at Ohio State University. During this total period of time, he has done tuberculin skin tests on 28,422 students of whom 3,530 (13.8 percent) gave a positive reaction. In conjunction with these tuberculin tests, 29,844 students had chest X-rays, with the result that 16 had radiological evidence of active tuberculosis, 10 had questionable activity, and 112 had inactive lesions. A histoplasmin skin test

was also done on these students, and 10,873 (48.4 percent) gave a positive reaction.

Warren E. Forsythe in the report of the University of Michigan Student Health Service for 1950–51 reported 11 cases of active tuberculosis in the student body for the year 1950–51, from a total enrollment of 24,305.

During the 5-year period beginning in 1945, Shaw (*2*) examined 1,113 medical and dental students at Guy's Hospital in London and found 11 cases of tuberculosis at the time of entry; an additional 10 cases were discovered after entry into the medical or dental school. Of the original 11 cases, only 1 was diagnosed as "apparently inactive," and this individual had a subsequent breakdown of the lesion. All the remaining 10 had some degree of activity when the diagnosis was first made. Epifanio (*3*) in 1952 reported the results of a 10-year study of the problem of tuberculosis in university students in Uruguay. During this period of time, 12,285 students were examined by means of photoroentgenograms and tuberculin tests, and 193 cases of the disease were found. These patients were treated by private physicians of their own choice, and the author reports 72.5 percent as "total cures," and 1.6 percent fatalities.

Kemp (*4*) reported on 28,880 X-rays obtained on students at the University of Texas between November 1946 and October 1947. Five-tenths percent of these students were found to have tuberculosis in some stage. An additional 0.4 percent had some type of nontuberculous pathology. No data are given on the recurrence rates in the cases of tuberculosis that were found. Canuteson (*5*) in 1948 reported the results of a study of 24,468 students admitted to the University of Kansas between the years 1932–46, inclusive: A definite diagnosis of tuberculosis was made for 87. Follow-up studies are not reported.

The tuberculosis committee of the American Student Health Association reports that of 345,158 students examined by X-ray in 1,954 colleges for the academic year 1945–46 (*6*), 139 were found to have tuberculosis. Two hundred and ninety-one cases were discovered by tuberculin-testing programs employed in 105 colleges having a total enrollment of 360,599. The total number of all cases diagnosed for 1946–47 was 630; 590 students were diagnosed as "arrested" and were permitted to resume or continue their college work. Data on the rate of recurrence of activity in these 590 students are not presented in the report.

Cox and Sutherland (*7*) in 1946 reported on the incidence of all forms of tuberculosis in a group of 502 medical students and 630 graduate students in New Zealand. They found the overall incidence of active tuberculosis to be 2.76 percent after the commencement of medical study. No data are presented on followup studies of these patients. Sayago and del Arroyo (*8*) in 1946 published a report of a tuberculosis survey on 328 medical, dental, and pharmacy students, 95.8 percent of whom had a positive Mantoux test, but only 3.3 percent had radiographic evidence of active or suspicious pulmonary lesions.

Palchanis (*9*) has arrived at the very important conclusion that the incidence of tuberculosis in individuals who do not participate in voluntary survey programs is approximately 10 times as great as among those who do. If his data can be applied generally, it would have to be assumed that in order to be representative of the total number of cases, an X-ray would have to be mandatory for all individuals in a group or population. Undoubtedly, this factor is frequently overlooked in routine college surveys, for in many of our institutions the chest X-ray is obtained on a purely voluntary basis.

Florida State University Study

Over a 4-year academic period beginning in September 1948 and ending in July 1952 a study was conducted at the Florida State University, Tallahassee, Fla. It was based largely on radiographic studies made by mobile units of the Florida State Board of Health at the time of each fall registration. X-rays were also made at the beginning of the 1951 summer session. Late registrants and others who for various reasons were missed at the time of the mass surveys were called to the university hospital where films were made in the department of radiology. Radiographic interpretations were made by Dr. C. M. Sharp, director, bureau of tuberculosis control, Florida State Board of Health.

From the outset, every effort was made to make this procedure mandatory for the entire student body. During the first 2 years of the study, however, certain small religious groups vigorously opposed the X-ray as a requirement for admission to Florida State University, and for them it was waived. In later years, this opposition was largely overcome, and no known exceptions were permitted. The faculty and staff of the university were also X-rayed, on a compulsory basis, during the 4-year period, but the results obtained on these groups will not be reported at this time.

On the basis of these procedures, 21,855 radiographs were made, a figure roughly 4 times the total enrollment for any one year, since all students were X-rayed at the beginning of each academic year. For those students, therefore, who were beginning their freshman year in 1948, 4 X-rays were made, while correspondingly fewer films were obtained for the other classes.

On the basis of these survey films plus the application of additional diagnostic measures wherever indicated, 19 cases of tuberculosis were discovered for the entire 4-year period. Of these, 7 had been previously undiagnosed, and the remaining 12 were old cases. Each of the 7 new cases was promptly withdrawn from the university and was admitted to a sanatorium. Of the remaining 12, 1 received a disciplinary dismissal from the university for causes not related to his tuberculosis; 1 was enrolled as a "special student" and took only 1 or 2 courses at a time; 1 failed to return to the university after the first year, and 7 of the remaining 9 were compelled to interrupt their education at least once as a result of the development of activity of the lesion.

It may be said, therefore, that of the 12 apparently arrested cases who were permitted to enroll in the university during this 4-year period, only 2 continued their education without interruption. One of these has now graduated. The other has remained continuously in school but has not yet graduated.

World War II Veterans

Most of the published data on tuberculosis in university students have dealt largely if not solely with statistics on the numbers of active and inactive lesions, and the results of various studies in institutions of higher learning in the United States are being tabulated from year to year by the Committee on Tuberculosis Control of the American College Health Association. Only a few of the studies reported, however, deal with the problem of the reactivation of old lesions. It has been this factor of the rate of recurrence of activity which has been given primary attention in the present study at Florida State University.

The problem of whether or not to permit an individual with an "inactive" or "apparently arrested" case of tuberculosis to enter a university deserves a great deal of consideration by the medical personnel responsible for making such decisions. Most of the patients in this classification in the present study were World War II veterans in whom the disease was classified as "service-connected." All of them arrived at the university with a statement from the Veterans Administration or some other responsible medical authority to the effect that appropriate studies had indicated that their disease process "had reached a state of arrest."

In most instances, the applicant brought a medical opinion to the effect that he was physically able to attend a university. An opinion such as this is exceedingly difficult to evaluate. In the first place, a wide variety of medical advice is sought by individuals with tuberculosis, and the criteria upon which recommendations for future conduct are based are at best not uniform. In the second place, a student who becomes an integral part of the life of a university almost always finds that demands are made upon his time and resources which he had not anticipated and which would not be brought to bear in a life outside an institution of higher learning.

Specifically, during times of increased emotional tension, as in examination periods, the student feels called upon to put forth an added amount of energy in order to make a superior showing. At times such as these he usually convinces himself that it will be safe to forego the prescribed rest periods and other measures designed to facilitate his full recovery.

The likelihood of recurrence of activity in in-

active lesions in patients involved in the study at Florida State University does not appear to have been significantly affected by the amount of work they were allowed to take at any given time, or by the length of time the disease process had been arrested. For example, one patient had qualified under the criteria set forth in Diagnostic Standards (*10*) as an inactive case for more than 5 years. In October 1951, a routine chest film disclosed no change in the status of the lesion, but 3 months later the patient had developed marked extension of the process with evidence of cavitation. So far as could be determined, he had not deviated from his prescribed routine of conduct during this 3-month period. This, then, represents an example of a case of tuberculosis which had been arrested for 5 years, but which developed into a very explosive lesion while the patient was a student. It further serves to emphasize the necessity of frequent, adequate followups even for those persons presenting evidence of long periods of inactivity.

Advantage in Review Boards

In passing upon the advisability of allowing an individual with a known tuberculosis lesion to become or remain a student in a university, the physician must be forever mindful of the danger to other members of the student body and faculty, should this lesion break down. It is exceedingly difficult to deny an application for admission on this basis alone, but the danger of the spread of the infection to well students is so important as to dictate this decision in many instances.

In order to make the best possible judgment in doubtful cases, or possibly in all cases, some universities have found it to be advantageous to appoint a special medical board to review applications from prospective students who are known to have had tuberculosis. Such a board was appointed by the president of Florida State University in 1951. Its membership includes the State health officer, the director of the bureau of tuberculosis control of the State board of health, the director of the State tuberculosis hospital program, the director of the regional tuberculosis hospital, the county health officer, the medical director of the university hospital, and a representative from the medical society of the county in which the university is located. A committee such as this could not function satisfactorily in the absence of complete cooperation of all those concerned. At the Florida State University it appears to be an ideal way of handling these very difficult cases.

Summary

In summary, during the period of the study at Florida State University, 7 active, previously undiagnosed tuberculosis cases were identified, and 12 previously diagnosed cases were studied at the university. All 7 of the new cases were withdrawn from school at the time of diagnosis and referred to sanatoriums for treatment. Of the 12 students with arrested lesions, 3 did not return to the university for reasons not related to their pulmonary disease. One of these is known to have developed active tuberculosis in the armed forces. Only 1 of the 9 remaining in this category has been able to graduate without having to withdraw at least once because of recurrent activity. One student has remained continuously in school but has not yet graduated. Thus, all 7 patients with previously undiagnosed tuberculosis and 7 of 12 patients with old tuberculous infections evidenced activity at the time of diagnosis or before completing their college education.

The inference that all persons with arrested tuberculosis should be denied admission to a university is not justified and should not be drawn from the small number of cases reported here. The indication is, rather, that an energetic case-finding and followup program is essential.

REFERENCES

(*1*) Tuberculosis surveys (editorial). J. A. M. A. 143: 379 (1950).

(*2*) Shaw, A. B.: Tuberculosis in medical and dental students. Lancet 263: 400–404 (1952).

(*3*) Epifanio, C.: Respiratory pathology in university students. Hoja tisiol. 12: 152–163 (1952).

(*4*) Kemp, H. A.: Controlling tuberculosis on the college campus. J. Lancet 71: 152–154 (1951).

(*5*) Canuteson, R. I.: Tuberculosis case-finding in college. J. Kansas M. Soc. 49: 416–419 (1948).

(*6*) American Student Health Association: Tuberculosis among college students. 16th annual

report of the Tuberculosis Committee, American Student Health Association, for the academic year, 1945–46. J. Lancet 67: 136–141 (1947); 68: 435–440 (1948).

(7) Cox, L. W., and Sutherland, J. D. C.: Tuberculosis among medical students. New Zealand M. J. 45: 102–106 (1946).

(8) Sayago, G., and del Arroyo, A. G.: El indice de la infección tuberculosa en los estudiantes de la Universidad de Porto Alegre (Brasil). Prensa med. argent. 33: 1816–1823 (1946).

(9) Palchanis, W. T.: Prevalence of previously unknown tuberculosis in persons not participating in mass chest roentgenographic surveys. Am. Rev. Tuberc. 65: 451–454 (1952).

(10) National Tuberculosis Association: Diagnostic standards and classification of tuberculosis. New York, The Association, 1950, p. 36.

From the SOCIAL SECURITY BULLETIN . . . . .

Workmen's Compensation: Measures of Accomplishment

Various measurements of the scope and adequacy of workmen's compensation programs, developed over a period of years by the Social Security Administration's Division of Research and Statistics, are summarized in the March 1954 Social Security Bulletin. The authors, Dorothy McCamman and Alfred M. Skolnik, also present detailed analyses of newly available data.

Coverage of the State and Federal programs now extends to almost 4 out of every 5 civilian wage and salary workers and to a slightly higher proportion of civilian wages and salaries. Covered payrolls in 1952 amounted to $135–140 billion, a 287-percent increase over 1940. The number of workers actually protected by the program, 38½ to 39½ million in the average month of 1952, is measured against the number who might be covered if the laws did not exclude such groups as agricultural and domestic workers and employees of small firms.

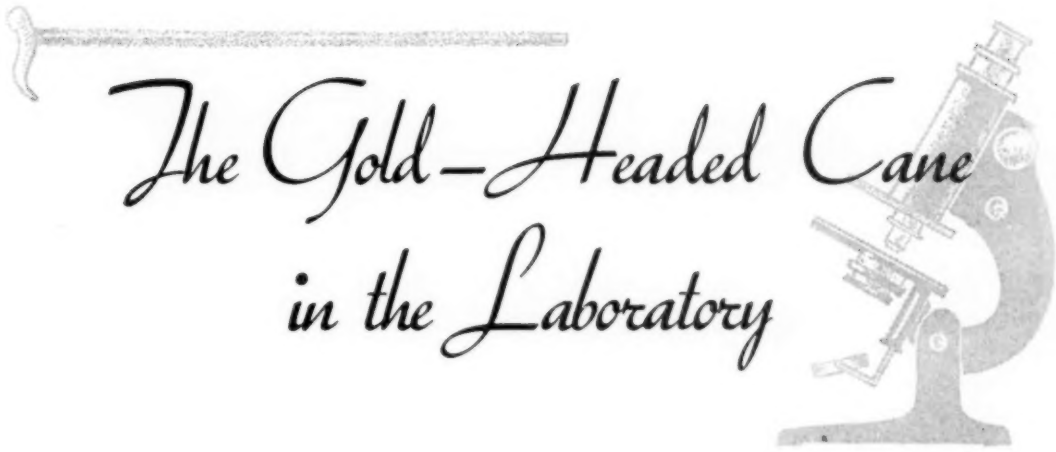
Summary data on benefits for the 1939–52 period show a 1952 total of $787 million—$527 million in compensation payments and $260 million in medical benefits. This total represents a 235-percent increase over 1939. To account for a slower rate of growth in benefit payments than in covered payrolls, the authors draw on Bureau of Labor Statistics data on work accident rates but find only partial explanation therein.

Six-tenths of all covered workers were in States where the maximum benefit payable for temporary total disability, in 1952 and after the liberalizations of 1953, was 40–50 percent of the average wage earned the preceding year. The article also includes a rough calculation of the effect of the waiting period in further reducing the proportion of wage loss which would be compensated in the average case of temporary total disability.

The cost to employers of protecting their workers under compensation laws was $1½ billion in 1952—just under 1.0 percent of covered payroll. For ratios of incurred losses to earned premiums and for expense ratios use is made of published data on the countrywide business of private carriers operating in New York State, representing about 80 percent of the total business underwritten for United States employers by insurance companies.

Reported are the results of a project designed to produce an estimate of the number of injured workmen and survivor families currently drawing cash compensation payments. Only a broad range—rather than definitive figure—could be developed, despite generous assistance from the major underwriters of workmen's compensation business.

Social Security Bulletin is issued monthly by the Division of Research and Statistics, Social Security Administration. $2 a year ($2.75 foreign mailing). 20 cents a copy. Superintendent of Documents, Washington 25, D. C. (Reprints will be available.)



The Gold-Headed Cane in the Laboratory

By RENÉ J. DUBOS, M.D., Sc.D., Ph.D.

ALTHOUGH most of medical science is of very recent acquisition, the healing art has been practiced effectively for thousands of years without the benefit of laboratory knowledge. The skill of ancient physicians was largely empirical, but it permitted them, nevertheless, to formulate prognoses, relieve symptoms, and not uncommonly effect cures. It was an empiricism based on wisdom, experience, and knowledge of human nature.

The fashionable English physician of the late 17th century went on his sick calls dressed in a silk coat, breeches and stockings, with buckled shoes, lace ruffles, full-bottomed wig, and carrying a gold-headed cane. Typical of this class was John Radcliffe (1650–1714), physician to William and Mary and to Queen Anne.

Dr. Dubos, member of the Rockefeller Institute for Medical Research, presented the third R. E. Dyer lecture October 22, 1953. The major portion of the lecture is printed here. The full text will be published by the National Institutes of Health. Dr. Dubos enjoys wide recognition not only for fundamental work in bacteriology but also as an author. He pioneered in the study of antibacterial enzymes and antibiotics and isolated tyrothricin and gramicidin, the first crystalline antibacterial substance, from spore-forming bacteria. Another contribution was the development of new media for the cultivation of the tubercle bacillus.

The R. E. Dyer lecture, honoring Dr. Rolla E. Dyer, was established in 1950 and is administered by the National Institutes of Health, Public Health Service.

Empiricism vs. Experimental Science

For 150 years, Radcliffe's gold-headed cane was passed along in succession to some of the most successful practitioners of England. In Matthew Baillie (1761–1823), however, it found a master of a different mentality. With a few of his contemporaries, Baillie considered that science was rendering obsolete the assumed gravity and pompous airs of fashionable physicians. Indeed, it was obvious that the clinical art had then come to represent a formal tradition rather than an attitude based on living experience with disease. No longer regarding the gold-headed cane as a necessary appendage of the medical profession, Baillie discontinued carrying it on his sick calls. After his death, his wife found the cane in a corner of the con-

sulting room and presented it in 1825 to the museum of the Royal Academy of Physicians. There it has remained, among other relics of that learned body, a symbol of a phase of medicine without relevance to medical practice or science in the modern era. As the cane went to its final sanctuary, persons who were to change the course of medicine were beginning their lives—Florence Nightingale in 1820, Rudolf Virchow in 1821, Pasteur in 1822, Lister in 1827.

Many of the most brilliant practitioners of clinical medicine of the 19th century, however, continued to hold that their art had nothing of importance to learn from biological sciences. Some of them in particular achieved a place in history by the passion with which they opposed the germ theory of disease. The French clinician Pidoux, a representative of traditional medicine—always impeccably clad in a gold-buttoned coat—was one of those who took up the cudgels against Pasteur at the Paris Academy of Medicine. Where Pasteur saw disease as caused by specific kinds of microbes, Pidoux invoked the concept of diathesis, emphasizing that disease was determined by the particular constitution of the patient. He held the view that any disease could be caused by a multiplicity of external and internal causes and could not be regarded as due to one single specific agent. Necrotic processes could take place "along a number of roads each of which the physician should endeavor to close."

Pidoux and his like spoke in broad clinical terms, basing their doctrines on the phenomena of disease as observed in man. But their vague arguments were no match for the precise experimentation by which Pasteur, Koch, and their followers defended the doctrine of specific causation of infectious disease. Experimental science triumphed over clinical experience, and within a decade the theory of specific etiology of disease was all but universally accepted, soon becoming the dominant force in medicine. Eventually, the doctrine of specificity was generalized to encompass the concept of specific "biochemical lesion" which is proving today as fruitful in the fields of metabolic, degenerative, and neoplastic diseases as the concept of specific microbial etiology has proved in dealing with the problem of infectious diseases. There is no doubt that the doctrine of specific etiology has constituted an instrument of unmatched power for the experimental study of pathological processes and has been responsible for most of the great advances, theoretical and practical, realized in medicine during the past century.

It is now apparent, however, that the concept of single etiology often fails to provide a complete explanation for the pathogenesis of diseases under natural conditions. In "complex infections," two or more microbial agents are required to reproduce the pathological picture—the participation of influenza virus and *Hemophilus influenza suis* in swine influenza being the classical example. In practically all infectious and metabolic disorders, physiological and environmental factors can readily be shown to be important determinants of the disease process.

Tuberculosis Infection vs. the Disease

In general, the accounts of the controversies which heralded the germ theory of disease dismiss the views of those who objected to some of its extreme tenets as the voice of obscurantism and reaction in medicine. Yet there were shrewd thinkers among the physicians who were not convinced that micro-organisms alone could account for the causation of disease. They did not deny that micro-organisms were present in diseased tissue. They emphasized rather that micro-organisms could invade and cause disease only after the tissues had been weakened by some form of physiological misery.

Rudolf Virchow was one of those who believed that micro-organisms are secondary invaders and that physiological disturbances are always the primary cause of disease. In 1847, while still a young man of 26, he had served as a member of a medical commission sent by the Prussian Government to investigate the widespread occurrence of epidemics in the industrial sections of upper Silesia. There he noticed that fevers were particularly prevalent among those living under miserable circumstances, and he became convinced that poverty was the real breeder of disease. He pointed out,

furthermore, that Negroes living in Europe were much more likely to acquire tuberculosis than those who had stayed in their native lands or than white persons of the same age working at the same trades and exposed to the same risks of infection. Did not this incriminate the physiological disturbance brought about by the change from the tropical to the northern climes as primary cause of the disease?

Although Virchow recognized the importance of Koch's discovery of the tubercle bacillus, he had good epidemiological reasons to remain unimpressed while presiding at the now famous meeting of the Berlin Physiological Society in 1882 where Koch first presented his report. Indeed, Virchow would have been even less impressed had he known, as we know today, that almost every adult individual in Europe at that time was infected with virulent tubercle bacilli and that Koch himself was certainly infected, as indicated by the violence of his reaction when he injected tuberculin into his own arm in 1891. Virchow could have argued that since the tubercle bacillus was an ubiquitous component of the environment, the factors which converted mere infection into overt symptoms and destructive pathological changes were the real determinative causes of tuberculosis.

The knowledge accumulated during the past 75 years has left unsolved many of the problems of the pathogenesis of tuberculosis. Tuberculin tests reveal that even in our communities a very large percentage of the adult population has been at some time infected with tubercle bacilli. Yet, the morbidity and mortality of tuberculosis have decreased by ten- to twenty-fold during the past century. It is obvious, therefore, that while the tubercle bacillus is the specific etiological agent of infection, there are other factors which are responsible for converting infection into tuberculous disease. In other words, the etiology of disease cannot be explained entirely in terms of the etiology of infection.

Multiple Etiology in Human Disease

Another example illustrates the contrast between infection and disease. In man, the herpes simplex virus is usually acquired during early years. Throughout most of the life of the infected individual, the virus lies latent in the body, without causing any symptom or obvious pathology until "provoked" into activity by some physiological disturbance. As is well known, fever (herpetic) blisters can be elicited by a variety of nonspecific unrelated stimuli, as different one from the other as menstruation, colds and fevers of various origin, ultraviolet radiation, or eating cheese. Herpetic blisters thus provide a striking example of an infectious disease of man in which, contrary to the original tenets of the germ theory, the living agent of the disease (the germ) may be present all the time in the host—be intrinsic so to speak—whereas the determinant of the pathological process is some physiological disturbance or some other extrinsic factor of the physicochemical environment.

There are many examples of infections caused by either protozoa, fungi, bacteria, rickettsia, or viruses which are ubiquitous in their distribution among human, animal, or plant communities but which remain in a latent, essentially inactive state under ordinary "normal" circumstances. These latent infections express themselves in the form of disease only after some physiological or environmental factor has caused a primary disturbance which allows the microbial agent to manifest its potential pathogenicity. In fact, the nature of the pathological processes may to a large extent be independent of the specific microbial agent associated with it. Thus, it has been frequently observed during recent years that the intensive use of chemotherapy in the treatment of subacute endocarditis caused by green streptococci, while successful in eliminating these organisms from the lesions and blood stream, often results in their substitution by other microbial species. As a consequence, forms of endocarditis associated with staphylococci or even gram negative bacilli are not uncommon in patients treated with antistreptococcal drugs. Seventy-five years ago, this would have appeared to the opponents of the germ theory as just one more example of a situation in which the fundamental disease is the organic lesion (on the heart valves) and the microbial agents merely opportunistic secondary invaders.

It is known that most, if not all human beings can acquire bacillary dysentery when first exposed to the disease under the proper field conditions, as shown by the fact that new bodies of troops transported to areas where dysentery is endemic rapidly fall prey to the disease. Yet, despite all the available knowledge concerning dysentery bacilli and despite the overwhelming evidence of the communicability of the disease, it has proved extremely difficult to establish experimentally in man or in animals an infection presenting the typical symptomatic and pathological characteristics of bacillary dysentery.

A few years ago, human volunteers ingested dysentery bacilli of the Flexner group recently isolated from patients and known to be virulent for mice. All precautions were taken to favor the establishment of the infection. It was first determined that the volunteers were not carriers of *Shigella* and had negative histories of diarrheal disease. They were given paregoric and sodium bicarbonate before and after receiving the infective dose, and water in order to dilute the gastric secretions and wash the material through the stomach quickly. Yet, administration of up to 95 billion bacilli failed to produce significant symptoms of dysentery in most volunteers, even though the bacilli could be recovered from their stools on several successive days. No greater success was achieved by introducing along with the bacilli a gelatin capsule containing 1 gram of feces collected from a patient with clinical dysentery and containing large numbers of living bacilli.

Few are the human beings who do not suffer from the common cold once or several times every year, and few are the epidemiologists and laymen who do not believe that the affliction spreads readily by contact and that certain environmental circumstances, such as wet and cold weather, draughts, and fatigue, increase susceptibility to it. Since men find it so difficult to avoid "catching" a cold although they are most reluctant to "take" it, one could expect that it would be easy for the experimenters to "give" the disease to human volunteers willing to submit themselves to all the conditions assumed to be favorable for its transmission. But this has not proved to be the case. It has been known for almost two decades that one can elicit mild symptoms of coryza in a certain percentage of human beings by administering to them filtrates of nasal washings and discharges from individuals in the early stages of the common cold. Thus, the etiological agent appears to be a filterable virus. It has also been found in early experiments that human beings are less likely to develop symptoms when exposed to the infective dose in an environment conducive to physiological and mental well being.

Experimentation seems to confirm what had been suspected from observations in daily life, namely, that man is highly receptive to the common cold agent under special circumstances. But these circumstances are not easy to define as was the experience of the workers of the Common Cold Commission in England. In experiment after experiment, they introduced, intranasally into human volunteers large volumes of presumably infective discharges freshly collected from patients in the acute phase of the disease, but only a small percentage of the would-be victims developed acute signs of cold, even if exposed to air draughts in wet socks for hours immediately after having received the infective dose. Whatever the technique of infection used and whatever the environmental circumstances, the common cold so difficult to escape in ordinary life manifested itself to the experienced investigators who tried to conjure it only in a small percentage of their human volunteers.

Germ Theory Limitations

It is somewhat entertaining to muse over the fact that although all textbooks of bacteriology and infectious disease present the Henle-Koch postulates as the very bedrock which gives permanent basis and scientific dignity to the germ theory of disease, these postulates have hardly ever been satisfied in man. In reality, the faith that micro-organisms play the primary role in the causation of disease grew out of the forcefulness of Pasteur's and Koch's convictions, rather than out of the unimpeachability of the evidence which they presented.

Lest this statement be considered as a facile and irresponsible exercise in "debunking," let us admit immediately the obvious fact that

Pasteur, Koch, and their disciples and followers based their conviction on facts of absolute validity. But these facts were valid only for the very limited and well-described circumstances under which they were observed. It was no small part of Pasteur's and Koch's vision and genius that they selected for the demonstration of their thesis experimental situations in which it was not only necessary but also sufficient to bring the host and parasite together in order to reproduce the disease. Farm and laboratory animals never carry the anthrax bacillus; all guinea pigs are susceptible to tuberculosis; injection of rabies virus under the dura of dogs always gives rise to paralytic symptoms, and so forth. Thus, by the skillful selection of their experimental models, Pasteur and Koch could eliminate from their studies the factors other than the parasite which are necessary to demonstrate that infection can result in symptoms and pathological alterations. The techniques of experimentation which they worked out were designed to test the pathogenic properties of parasites under reproducible conditions—ideally a highly susceptible animal placed in a simple, defined, and constant environment. Useful as this artificial system has been for the study of some of the properties of microparasites, it has led to the neglect, and indeed has often delayed recognition, of the many other facts which are essential to the causation of disease under circumstances prevailing in the natural world—the physiological characteristics of the host and the physicochemical as well as social environment.

Disease Complex in All Life Forms

The examples used so far have been taken from human pathology to illustrate the view that the causation of disease under natural conditions often involves the simultaneous operation of several independent etiological factors. In reality, however, this holds true as well for many varied types of pathological processes in all classes of living things.

In nature, many bacterial species called "lysogenic" carry in an inactive form (prophage) one or several bacteriophages potentially capable of causing their lysis. Under ordinary conditions, the prophage is apparently reproduced with each bacterial division without causing any detectable disturbance in the cell. This equilibrium can be upset by a number of nonspecific procedures—for example, irradiation of the lysogenic culture—in such a manner that the prophage is converted into active bacteriophage, multiplies abundantly, and causes the destruction of its host cell. Thus, the prophage behaves as a pathogen for the cell that carries it only when the latter is subjected to the proper kind of stimulus. One might say that the prophage makes the bacterium sensitive to the radiation, or that the radiation makes it susceptible to the phage, or that both agents are required for the causation of lysis. In fact, it has been shown that, in certain cases at least, the activating effect of radiation can take place only in media of certain composition, thus making even more complex the etiological determination of lysis.

As is well known, the agent responsible for mammary carcinoma among breeding female mice has all the characteristics of a virus. Although the Bittner virus occurs throughout the tissues of infected animals, it causes no obvious sign of disease and in particular no tumors until lactation has begun. Male mice do not develop breast cancer even if they carry or have ingested the virus, nor do female mice unless under the stimulus of continuous reproductive activity. Thus, whereas the virus can remain latent in the animals which harbor it, the hormonal and other stimuli which accompany reproduction and lactation are necessary and sufficient to induce it to elicit pathological reactions. In other words, these physiological stimuli are, as much as the virus, etiological agents of the mammary tumors of mice.

All the pathological processes so far mentioned to illustrate the concept of multiple etiology involve the participation of microorganisms or of viruslike agents. But one could also find in other fields of pathology many examples in which the causation of disease probably requires that several independent factors act together or in succession. Thus, it is well recognized that conditions as varied as hemorrhagic shock, peptic ulcers, or degenerative diseases are multifactorial phenomena requiring for their genesis the simultaneous occur-

rence of several physicochemical and vascular disturbances conditioned by a variety of organic and psychogenic controls.

The problem of causation of the plant cancer, known as crown gall, because of the precise knowledge which has been gained of its physiological determinants and chemical basis, illustrates in a striking manner the conceptual difficulties involved in the determination of etiology. It is possible to induce at will characteristic tumors (crown galls) by inoculating sunflower or certain other plants with pure cultures of *Agrobacterium tumefaciens*. Since no other foreign organism or substance is known to be capable of causing this pathological reaction, it seems fair to regard *A. tumefaciens* as the specific etiological agent. It has been established, however, that many of the secondary tumors developing on the same plant at sites removed from the initial infection are free of bacteria, and yet can be transferred in series to new plants, or propagated in tissue culture as self-reproducing structures. It is possible also to eliminate the bacterium from the tumor tissue by controlled heating, without affecting the power of autonomous growth of the latter. Thus, production of the cancer can be made independent of *A. tumefaciens*, which was at first its essential etiological agent.

It is known furthermore that extensive invasion of the plant by the bacterium may take place without resulting in tumor formation. Only plant cells which have been conditioned by certain stimuli associated with wound healing are rendered susceptible to transformation into tumor tissue by the bacterium. The physiological state of the host cells should, therefore, be considered also an etiological determinant of crown gall.

Finally, it can be shown that whereas the normal plant tissue requires indole acetic acid and the cocoanut-milk factor for growth in tissue culture, the self-reproducing tumor tissue can synthesize these essential growth factors (and perhaps others) and therefore does not need them. It is this biochemical characteristic which permits it to grow profusely and in a completely uncoordinated manner. Thus, at the present state of the analysis, the biochemical etiology of the disease appears to reside in an increased synthetic power, but on the other hand, it takes *A. tumefaciens* originally to induce the change.

Depending upon the specialized interests of the investigator and the techniques that he chooses to use, the primary etiology of crown gall can be regarded as a specific bacterium, a transmissible cellular change dependent upon a certain physiological state of the cell, or a biochemical disorder. The problem of etiology can be studied at different levels by the bacteriologist, the oncologist, the physiologist, or the biochemist. All points of view are justified, and discoveries at any one of the levels of investigation can add to the understanding of the mechanisms of the disease and probably lead to some technique of control.

Biological and Environmental Equilibrium

Obviously the "normal" existence and performance of any living organism demands a state of subtle equilibrium between its different component parts, as well as between them and the factors—living and physicochemical—of the environment. Hippocrates referred to the ideal state of nature as a "universal sympathy." Biological equilibrium, being the outcome of evolutionary forces, is maintained only if nothing changes in the environment. Any change is likely to disturb the balance of forces upon which depends the maintenance of the normal state. "Disease," Virchow said, "is life under altered conditions."

The factor which disturbs the equilibrium may affect only one or a few individuals and give rise to isolated cases of clinical disease, or it may affect simultaneously many members of the community and cause crowd diseases.

The fact that peptic ulcers, arteriosclerosis and other vascular disorders, and even certain forms of cancer are markedly influenced by various social and economic factors is sufficient proof that here again, as for infectious diseases, it is necessary to broaden the concept of etiology if one is to achieve a comprehensive picture of pathogenesis.

It is because the physician must deal with situations involving so many independent variables that clinical medicine has remained an art even today—an art based on wisdom and

skill derived from experience as much as on scientific knowledge and reasoning. The skill symbolized by the gold-headed cane was not mere charlatanism. Experience had taught the good physician to manipulate many of the factors—physiological, psychological, and social—which affected the reactions of his patient.

But knowledge based on empirical experience either remains static or at best develops slowly. Progress demands systematic experimentation. Methodologically, there is danger in adopting too broad a biological and clinical point of view in the study of disease—the danger of substituting meaningless generalities and poor philosophy for the concreteness of exact knowledge. It is one of the most important contributions of the doctrine of specific etiology that it saved the science and practice of medicine from the morass of loose words and concepts. But insistence on concrete facts need not deter one from acknowledging that, under natural conditions, the etiology of most diseases is multifactorial rather than specific. The laboratory worker can always circumvent the difficulty resulting from the multiplicity of etiological determinants by devising operations that permit him to study each of these separately and in various combinations.

By using a broadened concept of etiology, encompassing intrinsic and extrinsic determinants of disease, he will eventually develop a therapeutic science that will incorporate the human wisdom and empirical skill of the traditional medical art. "The variable composition of man's body hath made it an Instrument easy to distemper . . ." Francis Bacon wrote. "The Office of Medicine is but to tune this curious Harp of man's body and to reduce it to Harmony."

Russell M. Wilder Fellowship Established

The National Vitamin Foundation is inviting individuals holding doctorate degrees in medicine or one of the biological sciences, who are interested in continuing their training in nutrition, to become candidates for the newly established Russell M. Wilder Fellowship.

This postdoctorate fellowship was created by the Foundation to honor Dr. Wilder of the emeritus staff of the Mayo Clinic "for his more than 40 years of devoted service and significant contributions to medicine and public health, and particularly for his leadership in advancing our knowledge of diseases of metabolism and nutrition."

Dr. Wilder was the first director of the National Institute of Arthritis and Metabolic Diseases, National Institutes of Health, Public Health Service. He retired on July 1, 1953. He is a member of the Board of Editors of *Public Health Reports*.

The fellowship is for 3 years and pays the recipient $4,500 for the first year, $5,000 for the second, and $5,500 for the third year. It becomes effective September 1, 1954. Candidates must give reasonable assurance that they will complete the fellowships and continue to work in the field after completing their studies. Further information may be obtained from the National Vitamin Foundation, 15 East 58th Street, New York 22, N. Y.

The Public Health Training Program In Pennsylvania

By KARL M. MASON, B.S.S.E., M.P.H.

THE INITIAL IMPETUS for the development of a training program for professional and technical public health personnel in Pennsylvania was a survey by the American Public Health Association in 1948. At the request of the Pennsylvania Medical Society and other professional and community organizations in the State, the Committee on Administrative Practice conducted a comprehensive study of the Commonwealth's public health administration. The committee's report entitled "Keystones of Public Health for Pennsylvania" contained eight major recommendations, including the establishment of county health departments, the reorganization of the State department of health, the adoption of a merit system, and the extension of professional training opportunities to all public health workers in the State.

Under the training recommendations in the report was the following explanatory paragraph: "Nothing could be done which would have a greater impact on services to the people of Pennsylvania than to build up a large group of well-trained public health workers. Training, all of which must be of a high professional quality, should be of several kinds: formal and informal, preservice and inservice, classroom, and supervised field experience. Continuous training activity should be a major responsibility of the State department of health, with participation by local official and voluntary agencies. There should be close liaison with every professional educational institution in the field of public health in the Commonwealth." Of the eight keystones, action was taken first on this training recommendation.

In 1949, a conference of four agencies interested in promoting better public health services in Pennsylvania—the Graduate School of Public Health of the University of Pittsburgh, the Pittsburgh Department of Health, the Pennsylvania State Department of Health, and the Public Health Service—resulted in an agreement to establish the Pittsburgh Field Training Center. Expeditious action by all interested parties culminated in the presentation of the first environmental sanitation training course in early 1950.

Because of the Public Health Service's participation, the activities of the training center encompass several States on a regional basis. Trainees have been enrolled from Ohio, New Jersey, and Illinois, as well as from Pennsylvania. Sanitarians from the Pittsburgh Department of Health made up the first few training classes, but in recent years the predominant trainee has been the Pennsylvania State Department of Health sanitarian.

Although the program at the training center was fulfilling a vital need for environmental

Mr. Mason is director of professional training, Pennsylvania State Department of Health.

sanitation training, it soon became apparent that other steps were necessary if a broad training program for other public health workers was to be instituted as recommended in the American Public Health Association committee report. With this in mind, the State secretary of health, Dr. Russell E. Teague, invited the senior training officer of the training center to come to Harrisburg as director of professional training for the Pennsylvania State Department of Health. Prompt approval by the Training Branch of the Communicable Disease Center resulted in this change of assignment in August 1951.

Types of Training

During the past 2 years the professional training program in Pennsylvania has included all phases of training—graduate, undergraduate, field training, and continued education. In the graduate training program, selected candidates, usually employed in a supervisory or executive capacity, are enrolled in schools of public health for a full academic year. In most cases these students matriculate for the master of public health degree, although occasionally master's degrees are obtained in such specialties as nutrition and sanitary engineering. Graduate study for the doctor of public health degree may be offered to the administrators of extensive public health programs.

The undergraduate training program consists primarily of the enrollment of registered nurses in accredited schools of nursing for their certificates in public health nursing—a course of study which involves a minimum of two semesters. Because most registered nurses have been employed initially without public health experience or training, the State health department has assumed the responsibility of assisting staff nurses to obtain these necessary qualifications. Nurses who desire to obtain their bachelor's degree are granted leave without pay to complete their undergraduate work. In addition, nurses, chemists, bacteriologists, engineers, and other staff members enrolled in extension courses for academic credit receive financial assistance toward their tuition payments.

Field training has been defined by the Committee on Professional Education of the American Public Health Association as "an opportunity to study the field application of the principles and practices of public health." The Pennsylvania State Department of Health makes available to public health personnel several types of field training, each of which is designed to serve a distinct purpose.

Observation: A planned visit to a health agency to observe the public health program without active participation therein.

Orientation: Preparation of a person for a specific job under the auspices of the employing agency.

Supervised field experience: Planned instruction, observation, and active participation in a comprehensive organized public health program.

Apprenticeship: An extended period of active service under supervision in a public health program without prior academic training in public health.

Residency: An extended period of active service under supervision in a public health program following a period of formal academic training in public health.

As indicated in the table, the field training program has, to the present, involved only nurses, health educators, and sanitarians. Public health nurses who have taken portions of their undergraduate work or who have completed the requirements for the master of pub-

Participants in public health training program, Pennsylvania, since July 1, 1951

Professional category	Graduate study	Undergraduate study	Field training	Continued education	Total
Physician	5	------	------	8	13
Dentist	1	------	------	------	1
Nurse	9	64	9	124	206
Engineer	------	------	------	33	33
Health educator	2	------	2	------	4
Nutritionist	1	------	------	4	5
Sanitarian	2	------	47	159	208
Laboratory personnel	------	------	------	19	19
Industrial hygienist	------	1	------	4	5
Total	20	65	58	351	494

lic health degree, are assigned to qualified health departments for from 1 to 3 months of supervised field experience. Sanitarians, following their intensive course at the training center, are assigned to city and county health departments in adjoining States for 6 weeks of observation and supervised field experience. Field training for health educators has consisted of 1 to 2 years of apprenticeship with a selected health department prior to matriculation in a school of public health.

The continued education program includes short courses, seminars, institutes, and workshops. Because this type of training is adaptable to all levels of instruction, it is offered to all public health personnel regardless of their previous training and experience. With the active cooperation of department staff members and through close affiliation with colleges and universities, professional societies, voluntary health agencies, and the Public Health Service, the State health department assists in developing and conducting various kinds of training courses to meet the apparent needs of public health personnel in Pennsylvania.

Typical examples of continued education are the 10-week course in environmental sanitation for sanitarians at the training center, a 1-week course in cardiology for physicians employed in State tuberculosis sanatoriums, 2-week courses in such subjects as cancer, heart disease, tuberculosis, and mental health for public health nurses, and a 2-week course in radiological health for engineers.

Discussion

The Pittsburgh Field Training Center is one example of the existing coordination of training activities in the State. Although it is sponsored by four different health agencies, the designation of the director of professional training as director of the training center makes the environmental sanitation training program an integral part of the entire professional training program. Recruitment, orientation, field assignments, and financial arrangements are handled by the division of professional training, thus permitting the training center staff to concentrate on course content, teaching assignments, demonstration equipment, and audiovisual aids. Close contact between the State training and sanitation directors provides an analysis of the training needs, development of adequate programs at the training center, selective recruitment, and effective followup and evaluation.

Similar coordination in other training programs is achieved through active participation in the functions of professional organizations. Membership on committees of the State nurses associations and on the faculty of the University of Pittsburgh Graduate School of Public Health enables the director of professional training to obtain invaluable assistance in the planning and operation of training programs. For example, the director of professional training is the health department representative to the Pennsylvania League for Nursing, and as such, considers desirable qualifications for public health nurses in the State. He also helps plan to improve the various graduate and undergraduate curriculums, short courses, and workshops for this professional group.

A statewide Training Advisory Committee, composed of representatives of most of the agencies and educational institutions interested in training activities, completes the cycle of community participation in the professional training program for public health personnel in Pennsylvania.

PHR

Federal Fund Accounting System in California

By Robert G. Webster, M.P.H., and G. Leonard Johnston

ACCOUNTING for Federal public health funds in California was greatly simplified in 1951 when the California State Department of Public Health, the State Controller, and the State Department of Finance jointly sponsored legislation to streamline fund handling.

The new law provides, in general, that the California State Department of Public Health may pay all claims and charges for the program from State funds. The State is then reimbursed for the Federal share of the cost of the program or project by accounting transfers, quarterly, in lump sums, from the public health Federal fund, in which all Federal allocations are deposited. The California Health and Safety Code clearly indicates the procedures which may be followed:

117. The Public Health Federal Fund in the State Treasury is hereby created. All grants of money received by this State from the United States, the expenditure of which is administered through or under the direction of the State Department of Public Health, shall, on order of the State Controller, be deposited in the Public Health Federal Fund.

118. All money in the Public Health Federal Fund is hereby appropriated to the State Department of Public Health, without regard to fiscal years, for expenditure for the purposes for which the money deposited therein is made available by the United States for expenditure by the State.

119. The State Department of Public Health and the State Controller shall keep a record of the classes and sources of income deposited in, or transferred to, the Public Health Federal Fund, and of the disbursements and transfers therefrom.

120. The Director of Finance and the State Controller may approve any general plan whereby:

(*a*) Any expenditures which are a proper charge against the money made available by the United States and deposited in the Public Health Federal Fund may be paid in the first instance from any appropriation from the General Fund, expenditures from which are administered through or under the direction of the State Department of Public Health, and

* * * * *

(*c*)* The General Fund shall be reimbursed for expenditures made therefrom that are a proper charge against the Public Health Federal Fund or against any appropriation from any special fund. Such a general plan may provide for advance transfers from the Public Health Federal Fund to the General Fund, based on estimates of such expenditures that will be subject to reimbursement from the Public Health Federal Fund pursuant to such plan, and may provide for reimbursements to the Public Health Federal Fund, when necessary. Request for reimbursement or transfer pursuant to such a plan shall be furnished to the State Controller in writing by the State Department of Public Health, accompanied by such financial statements as the plan may provide; and on order of the State Controller, the required amount shall be transferred in accordance therewith.

This plan has greatly reduced the burden of accounting for that portion of the funds spent for State operations. A regular Federal budget is prepared at the beginning of the fiscal year. Allotment control cards are made, representing the total cost of each program or project, with a minus allotment card for each Federal fund which will share in the cost. The net total of these allotment cards balances to the total State appropriation, that is, the part of the

---

Mr. Webster is chief of the division of administration and Mr. Johnston is chief of the bureau of business management, California State Department of Public Health.

The California system and Tennessee's, described in the following paper, complete the presentation of simplified accounting methods used by the health departments of several States in handling Federal funds. The single operating account technique was discussed in the November 1953 issue of Public Health Reports, pp. 1071–1077, and the development of a simplified fund accounting system in Oklahoma was described in the January 1954 issue, pp. 51–57.

cost actually underwritten by State funds. A "reimbursement plan" is prepared showing the percentage of each project which is to be charged to each Federal fund. Federal funds, as received, are deposited with the State treasurer in the public health Federal fund.

Fiscal operations proceed exactly the same as though all costs were funded exclusively by the State. Quarterly, there is filed with the State controller a copy of the expenditure report, with the reimbursement plan percentages applied to the various projects. With this statement as the authorization, the State controller transfers the required amounts from the public health Federal fund to the State general fund. The transfer is always the amount reported on the Federal quarterly report, so in one operation the fund transfer and the Federal quarterly report are prepared.

Since in California there are substantial State appropriations for most public health programs, matching funds are no problem in establishing appropriate reimbursement percentages.

Federal funds allotted to local public health departments are handled somewhat differently. A contract is written between the State health department and each local health department, under which the local health department is reimbursed for a percentage of the funds expended for salaries and wages. Claims under these contracts are filed directly against the public health Federal fund, and are split on a prearranged plan between specific Federal grant categories on separate allotment expenditure cards.

The plan in use in California has saved countless hours of special claim handling, and separate fund accounting, and so far as can be determined, is flexible enough to provide for any foreseeable contingency. In addition the plan emphasizes the "one program" concept, since program directors need not be concerned as to whether the cost of the program is being funded by State or Federal money. Only in those few projects funded exclusively by Federal funds is this element a matter of concern, and then only from the standpoint of the future outlook.

Through this accounting mechanism State funding is provided for all operations during the early months of a fiscal year, so no problem is created by late Federal remittances.

A Decentralized System Of Health Department Accounting in Tennessee

By Hugh B. Halliburton

A STREAMLINED, decentralized budget system, which is a sharp departure from the previous method of deficits and detailed fund accounting at central office level, has been in operation in the Tennessee Department of Public Health since 1937, when the Reorganization Bill (Chapter 33, Public Acts of Tennessee, 1937) was passed.

The basis of the system is the establishment by the State budget director of a general fund from which quarterly allotments, based on legislative appropriations, are made to departments and agencies, each of which establishes an allotment account. In addition to the State allotment, this account includes estimated available Federal, local, and other funds. At the end of each quarter, the allotment for expendable receipts is adjusted by the State director of accounts, to agree with the amount collected and/or transferred from the special deposit accounts (trust fund accounts), as determined by the department or agency.

The amount of funds to be transferred to the health department allotment account from the deposit account is determined by a percentage distribution, based on the department's operating budgets. It is not necessary, however, to allocate the funds by percentages. Under Tennessee law, rules, and regulations, any desired method may be used to distribute the costs between funds so long as all other State and Federal regulations for handling public funds are complied with.

The health department's computations are

Mr. Halliburton is director of the office of business administration, Tennessee Department of Public Health, Nashville. Prior to 1942 he was State auditor for Tennessee.

made individually for each encumbrance and voucher, including salaries, travel, utilities, requisitions, and emergency purchases. This method involves increased detail work throughout the quarter, but work flow is even, and the time expended is more than offset by the time saved at the end of the quarter when reports must be made and specialized duties carried out.

The fact that, except for the four large counties—Davidson, Shelby, Knox, and Hamilton, all county appropriations for public health are disbursed by the State health department (which must keep a separate account for each county) is perhaps the chief obstacle to making one distribution of funds at the close of each quarter. A formula by which the State health officer could allocate public health funds direct to the counties, in the same way that allotments are made to State departments and agencies, might provide a solution to this difficulty.

Although Tennessee has found the individual voucher method satisfactory for making percentage distribution of funds, other methods, such as distribution by total quarterly budget expenditures or by a combination of this method with the individual voucher method, might prove more effective in other organizations.

Advantages of Single Account

No expenditure accounts other than the general allotment account are needed in the central accounting office when the single clearing account system is used. Expenditures for salaries and other items are reflected only for the total expenditure, and no breakdown of fund expenditures by object is required. The number of operating accounts necessary for complete accounting is reduced sharply, and funds may be commingled without issuing a separate disbursement voucher for each fund.

The greatest advantage of the single-account system is the flexibility afforded in utilization of funds. The control on line items and fund expenditures necessarily imposed by centralized State accounting, which requires a uniform accounting and reporting system, is often too rigid for proper functioning of a State health department. Centralized accounting places at least some limitation on the organizational setup of the accounting office and on the scope of financial data available for departmental use, whereas the decentralized system makes it possible to organize the health department accounting office so that fiscal information is readily available to program directors and to the department head.

However, if such a system is to work satisfactorily, responsibility must go hand-in-hand with flexibility. Any relaxation of controls by the State budget director and/or the State director of accounts presupposes assumption of increased responsibility by the department or agency, and failure to assume and to discharge satisfactorily this responsibility must result in tightened regulations. Fortunately, these apply only to the department or agency which fails to assume its responsibility.

To recapitulate, the following specific advantages, in ascending order of importance, are apparent in a decentralized accounting system for State governmental departments and agencies, such as the one described:

1. At central accounting level, elimination of the necessity for multiple expenditure accounts.
2. At department accounting level, reduction of the number of operating accounts.
3. Commingling of funds without issuance of separate vouchers for each fund involved in an expenditure.
4. Flexibility in utilization of funds.

The National Science Foundation And the Life Sciences

By ALAN T. WATERMAN, Ph.D., Sc.D.

Describing the National Science Foundation as a Federal agency "independent of specialized missions, yet having an interest in common with other Federal agencies in the progress of science and the national welfare," its director outlines its functions, organization, and programs, with particular reference to the medical and biological sciences. In so doing, he indicates trends in the philosophy of scientific research. A discussion of trends in support and expenditures for scientific research appeared in the February 1954 issue of *Public Health Reports*.

MEDICAL RESEARCH in the United States has increased substantially during the years since 1941, requiring an increasing number of medical scientists and larger expenditures of funds (*1, 2*). These increases in medical research, of course, are characteristic of the trends exhibited generally by scientific research and development activities in this country.

Also characteristic of the trends in scientific research, including medical research, is the enlarged support given by the Federal Government. Expenditures of the Federal Government for scientific research and development have risen from $97 million in fiscal year 1940 to $2,187 million estimated for fiscal year 1954 (*3*). This rise in the Federal appropriation for research has resulted in a greater assumption of the total national expenditure for science by the Government. In fiscal year 1953, for example, the Federal Government expended $2,205 million out of a total national scientific expenditure estimated at $3,500 million.

With this increase in appropriations for scientific research and development, the Government has an added responsibility to insure that such funds are expended wisely, in the interests of both science and the national welfare. The Federal structure for the support, administration, and carrying out of scientific research and development is complex. There are at present some 24 Federal agencies involved in scientific research, each having a common effect in in-

Dr. Waterman has been director of the National Science Foundation since 1951. He was formerly with the Office of Naval Research, Department of the Navy, and during World War II he served with the National Defense Research Committee. For his work as chief of field services, Office of Scientific Research and Developments, in 1945, Dr. Waterman was awarded the Medal for Merit.

creasing the national research potential and in serving the national welfare, yet each motivated by special responsibilities related to specific missions assigned by the Congress or the President. Thus, the research which the Department of Defense administers or carries out in the medical sciences has much in common with the research of the Public Health Service, but defense agencies must plan and support research to fulfill special requirements in relation to national defense.

The areas of common interest among all Federal agencies involved in scientific research and development require that effective channels be developed for the interchange of scientific information and that unnecessary duplication be avoided. The special interests imposed by assigned missions require, furthermore, that some overall planning exist to insure a balanced Federal research program. For such purposes, it seems wise that an agency independent of specialized missions, yet having an interest in common with other agencies in the progress of science and the national welfare, serve as a center for studying the Federal participation in research and development. Such an agency is the National Science Foundation.

Basic Mission

Established in 1950 as an independent organization on the policy level of Government, the National Science Foundation was authorized and directed by the Congress to fulfill the following basic mission:

1. Develop and encourage the pursuit of a national policy for the promotion of basic research and education in the sciences.
2. Initiate and support basic scientific research in the mathematical, physical, medical, biological, engineering, and other sciences.
3. At the request of the Secretary of Defense, initiate and support specific scientific research activities in connection with matters relating to the national defense.
4. Award scholarships and graduate fellowships in the mathematical, physical, medical, biological, engineering, and other sciences.
5. Foster the interchange of scientific information among scientists in the United States and foreign countries.
6. Evaluate scientific research programs undertaken by agencies of the Federal Government, and correlate the Foundation's scientific research programs with those undertaken by individuals and by public and private research groups.
7. Establish such special commissions as the National Science Board may from time to time deem necessary.
8. Maintain a register of scientific and technical personnel.

These are broad responsibilities. Principal functions of the Foundation may be divided into three categories: (*a*) the encouragement and support of basic research, (*b*) the training of future scientists, and (*c*) the development of national science policy, that is, the role the Federal Government should play with respect to science. Although each of these functions is related to the others, the first two may be thought of as the operating programs, and the last may be considered as the study or evaluation function of the Foundation.

Support of Basic Research

The broad responsibilities of the Foundation, of course, have a specific relation to the life sciences, which include the biological, medical, and agricultural sciences. As an operating agency, the Foundation awards grants and makes contracts for the conduct of biological and medical research and awards graduate and postgraduate fellowships in those areas.

Grants and Contracts

Grants and contracts for basic research in the life sciences are administered by the division of biological and medical sciences of the Foundation. In general, proposals for research in the life sciences originate with the scientists and are selected with the help of scientific consultants who serve on advisory panels to the Foundation. Selections are based primarily on scientific merit. Other criteria involved in the review of proposals are the scientific ability of the project personnel, the relation of the proposal to contemporary research in the field, the scientific resources of the institution, the reasonableness of the budget, and the merit of the proposals in relation to others received by the

Foundation in related fields of science. In short, each investigator who submits a proposal to the Foundation may feel that it has been fairly considered by a competent group of his own colleagues.

The review procedure resembles that of other Federal agencies making grants or contracts for scientific research, but in two respects it does differ. The differences are the result of the general basic research mission of the Foundation and the functional breakdown of the Foundation's biological and medical research support programs.

"Free" Research

In its program for the support of basic research, the Foundation is free from the limitations imposed upon other agencies by their assigned mission. The interests of the Foundation in basic research are the promotion of science and the strengthening of basic research and education in the sciences. Such a broad interest allows the Foundation and its consultants to select research proposals without consideration of practical requirements of specific goals. Such "free" research is vital to the progress of science and the future of the Nation. Other Government agencies support basic research projects—and such support is a valuable part of all Government research programs—but their selection of proposals must necessarily be justified in terms of their assigned mission, and their support programs, therefore, have a close relationship to their operational goals. The Foundation, by having a greater freedom of selection, is able to complement the research of other agencies by giving support in neglected fields and by contributing to the development of a balanced Federal research program.

Functional Organization

The Foundation's program in the life sciences has been organized on a functional rather than on a disciplinary basis. In this way, the Foundation has regrouped research in the life sciences so that biological processes, whether in plant, animal, or man, will be seen in their basic contexts. Such a reorganization has the added advantage that interdisciplinary relationships in the life sciences may be more easily handled from both an administrative and a scientific information point of view. The Foundation's life science program is organized into the following categories:

Developmental biology: Asexual and sexual reproduction; maturation of germ cells; fertilization, growth, or reproduction of subcellular units; embryogenesis; histogenesis; organogenesis; general ontogeny; regeneration; adolescence; senescence.

Environmental biology: Gross effects of chemical, physical, and biological factors on the activities, distribution, and survival of organisms; biocommunities commensalism; symbiosis.

Genetic biology: Action and behavior of genes and chromosomes; nature and origin of inheritable characteristics and variations; effects of transformer substances; cytoplasmic inheritance; the "family history" of individuals and populations.

Molecular biology: The isolation, structural analysis, synthesis, and reactivity of biological substances; kinetics of biological reactions; diffusion.

Psychobiology: Physiological and psychological bases and correlates of the behavior of organisms at both human and subhuman levels.

Regulatory biology: Regulation of functional activities, including metabolism, respiration, circulation, digestion, absorption and assimilation, nervous and muscular activity, special senses, immunological responses, perspiration, translocation, transpiration, photosynthetic and metabolic plant processes, photoperiodism and phototropism, role and function of biocatalysts.

Systematic biology: Description of physical and functional characteristics; classification; meaning and integrity of species; "family history" and biological relationships of species, genera, and higher categories; life cycles; evolution.

The organization of the life sciences program of the Foundation is very similar to the classification advocated by Dr. Paul Weiss of the University of Chicago and chairman of the division of biology and agriculture of the National Research Council (*4*). Dr. Weiss points out

National Science Foundation research grants in the biological and medical sciences

Categories	Fiscal 1952		Fiscal 1953		Fiscal 1954, first 2 quarters	
	Number of grants	Amount	Number of grants	Amount	Number of grants	Amount
Developmental biology	9	$66, 975	4	$39, 600	4	$49, 900
Environmental biology	4	25, 060	2	7, 500	4	20, 300
Genetic biology	5	86, 800	7	100, 700	6	72, 100
Microbiology	9	83, 687	9	107, 600	(1)	(1)
Molecular biology	9	114, 500	11	134, 800	27	389, 500
Psychobiology	2	15, 400	8	101, 000	13	142, 350
Regulatory biology	15	173, 800	14	177, 900	29	369, 700
Systematic biology	11	106, 480	15	99, 700	16	122, 250
General	4	72, 760	2	30, 000	1	11, 500
Total	68	745, 462	72	798, 800	100	1, 177, 600

[1] Microbiology as a special category was reclassified into the other categories.

that "biology is in a state of flux" and that new concepts in research must be incorporated into our organization of the life sciences:

"Many of our traditional classifications were based on forms of life, as in bacteriology, botany, and zoology, or on methods of approach, as anatomy (for dissection) and biometrics (for measurement). With the growing realization of the general validity of certain basic principles common to all forms of life, a more natural organization of biology, according to inherent principles is gradually superseding the old pattern. Thus investigators and teachers have begun to draw promiscuously on bacteria, plants, animals, and man for knowledge and illustration of the principles of cell structure, metabolism, growth, heredity, excitation and coordination, adaptation, ecology, and evolution. Many of the greatest advances of biology have come in places where different specialties have combined forces in conjoint study. The spectacular development of genetics in this country has profited immensely from the correlation of facts from such diverse fields as cytology, animal and plant breeding, biochemistry, immunology, statistics, and taxonomy. As a result the old alinement gives way to a new, more natural and more consistent order."

1953 Program

The National Science Foundation program in the life sciences is a modest one in relation to the total national effort in these areas. During fiscal year 1953, 72 grants totaling $798,800 were made for support of basic research in the life sciences. In the previous year, 68 grants were made, totaling $745,462. The average research grant for both years was for $11,000 to run for 2 years, or about $5,500 per year. The accompanying table gives a breakdown of the support given in the various areas of the life sciences for the 2 years by the Foundation.

The Foundation's support of basic research in the life sciences does not distinguish between the medical and biological sciences, since fundamental studies in both sciences are intimately related. The Foundation generally does not support clinical research, except that of a basic nature, nor does it make grants for studies of special diseases since such studies are supported by other Government and private groups.

Increasing Supply of Scientists

The program of graduate and postgraduate fellowships in the sciences is designed to increase the national supply of trained scientists capable of undertaking basic research. Fellowships are awarded on the basis of ability only and are distributed among candidates of substantially equal ability on a geographic basis. The awards are distributed among scientific fields in proportion to the number of qualified applicants in each field.

A total of 557 fellowships was awarded for the academic year 1953–54 as compared with 624

for the previous year. Continuing the policy of emphasizing the first year of graduate study, the Foundation awarded 180 fellowships to first-year graduate students. A total of 166 awards was made to graduate students in the intermediate years; 169 to terminal year predoctoral students; and 42 to postdoctoral applicants.

Fellows are free to select any accredited institution of higher learning for their training. Stipends range from $1,400 for the first-year graduate student to $3,400 for postdoctoral study. Additional allowances for dependents, tuition, and other normal expenses are provided.

Out of a total of 1,004 applicants in the life sciences, 168 fellowships were granted. The distribution of fellowships by field was as follows: agriculture, 9; biochemistry, 35; biophysics, 14; botany, 19; genetics, 11; medical sciences, 14; microbiology, 18; psychology and anthropology, 10; and zoology, 38.

Developing National Science Policy

The two operating functions of the Foundation are complemented by the function of developing and encouraging the pursuit of a national science policy on the basis of special studies of science undertaken by the Foundation. The latter, of course, is a long-range program. The increased Federal participation in science makes it necessary that the Government study the various Federal science programs and their relations to the needs of science and the national welfare. To this end the Foundation has already completed preliminary plans for a survey of scientific activities in the United States in the following areas: (*a*) research programs of the Federal Government; (*b*) research in industry; (*c*) research at nonprofit institutions; (*d*) studies in scientific manpower; (*e*) studies on the exchange of scientific information; and (*f*) studies on the current status of scientific progress.

It should be noted that this function of the Foundation is directed to the pursuit of a national science policy. The Foundation's primary function in this area is advisory. In the words of Dr. Chester I. Barnard, chairman of the National Science Board (*5*):

"Except for certain specified operating functions, the Foundation is essentially an authoritative advisory body, potentially capable of securing factual knowledge and advisory opinion, that makes its advice authentic but not determinative. Whom does it advise? Obviously, first the President and the Congress; but collaterally also, through publication and consultation, other agencies and institutions, public and private, and individuals. The point to these observations is that the Foundation can neither police nor direct activities of other agencies, of academic institutions, of industrial research, or of individual scientists."

Science Studies

As part of the survey of science activities and as a result of other programs undertaken by the Foundation, several studies are now under way. The Foundation is collecting, on an annual basis, fiscal and budgetary data from all Federal agencies having science programs. The two compilations of these data which have been published (*6*, *3*) provide an insight into trends in Federal expenditures for science. They are useful in analyzing various aspects of the Government's research endeavor, such as the proportions expended between basic, applied, and development research, and the statistical relations of various fields of science. In fiscal year 1952, for example, the Foundation's report shows that of a total of $338,036,000 in Federal funds for science used at nonprofit institutions $65,804,000 went to the life sciences. Four agencies administered most of these funds: the Public Health Service, $18,330,000; the Atomic Energy Commission, $17,080,000; the Department of Defense, $14,917,000; and the Department of Agriculture, $13,109,000.

The Foundation also has under way two broad surveys in the fields of physiology and psychology. These surveys, expected to take about 3 years, are being carried out by the American Physiological Society and the American Psychological Association under contract with the Foundation. Thus, the Foundation is calling upon the scientists themselves and their representative societies to undertake a self-appraisal of the current status of their sciences. The survey undertaken by the American Psychological Association, for example, will include a study of methodology, theory, and applica-

tions of psychology to determine the interrelationships among various branches of psychology and the importance of psychology to other scientific fields. The study will also examine problems in psychological education, manpower, research support, communication, and administration.

Review of Scientific Advances

Another aspect of the Foundation's program of science studies is the activation of a continuing review of scientific advances in special areas of science. Through scientific conferences and symposiums supported by the Foundation, leading scientists are brought together to exchange information and ideas about their experimental work and their theories. During such conferences, scientists lay the plans for future research. Usually, the subjects discussed are at the frontiers of scientific knowledge, where ideas are in a state of change. During fiscal 1953, the Foundation contributed to the support of three such conferences in the life sciences: one on methods of determination of steroids in blood and urine; another on photosynthesis; and the third on specificity in development.

The Foundation has also taken steps, in cooperation with other Federal agencies, to compile regular lists of Federal grants and contracts for scientific research. These compilations will be useful to all Federal agencies in program planning and in helping to avoid unnecessary duplication. In the fields of psychology and the behavioral sciences, the Foundation now issues quarterly a report of Federal grants and contracts in these areas. In other areas of the life sciences, the Foundation participates in the Biological Sciences Information Exchange.

Scientific Manpower

In the field of scientific manpower, the Foundation has begun to accumulate data on the characteristics and population of various scientific disciplines. The Foundation is developing a National Register of Scientific and Technical Personnel. The register will be decentralized among several scientific and professional societies so that each society may maintain and use the data for its own needs. Duplicate cards will be kept by the Foundation. In the life sciences, the American Institute of Biological Sciences and the Federation of American Societies for Experimental Biology are developing comprehensive registers. According to present schedules, all the individual registers will have been established by June 1955. Based upon the data from the registers and the results of other manpower studies, the Foundation expects to publish a series of reports on the manpower characteristics in various fields of science, including professional requirements, training, and employment.

Scientific Information

Under the scientific information program of the Foundation, grants have been made for the support of important publications in the life sciences. During the last year, emergency support has been given to the publication of *Biological Abstracts*. This valuable information periodical has been faced with increasing publication costs; the Foundation's support, to which several Federal agencies have contributed, is designed to help in reorganizing publication procedures to cope with present needs. The Foundation has also made grants to the University of Chicago for partial support of a monograph titled "Vertebrate Visual System" and to the Torrey Botanical Club for the preparation of a 75-year index to the *Bulletin of the Torrey Botanical Club*.

During fiscal 1953, the Foundation has also provided assistance to American scientists which enabled them to attend important scientific meetings abroad. This program fosters the exchange of scientific information for the mutual benefit of all participating nations and provides United States scientists with direct contact with foreign research activities and personnel. The benefits from attendance at these meetings accrue to this country not only in terms of the increased competence of our scientists, but also in terms of the international goodwill, both scientific and cultural, which is created. The Foundation gave travel assistance to 18 biochemists to attend the Second International Congress of Biochemistry in Paris, France, July 21–27, 1952, and to 15 geneticists to attend the Ninth International

Congress of Genetics in Bellagio, Italy, August 24–31, 1953.

Summary

The Foundation, as may be seen from the various examples of its activities, is committed to a program of strengthening basic research and education in the life sciences. Both its operating and its staff programs are aimed at these ends. If the Foundation is to be truly significant as an instrument of national policy, it must be responsive to the growth and change in science. Although its study programs are designed to contribute to making it sensitive to the needs of science, it must in the long run depend upon the scientists and their representative societies and the cooperation of other Federal agencies in order to help it fulfill its responsibility: the encouragement of national programs for the progress of scientific research in the United States.

REFERENCES

(1) Deignan, S. L., and Miller, E.: The support of research in medical and allied fields for the period 1946 through 1951. Science 115: 321–333 (1952).

(2) Endicott, K. M., and Allen, E. M.: The growth of medical research 1941–53 and the role of the Public Health Service research grants. Science 118: 337–343 (1953).

(3) U. S. National Science Foundation: Federal funds for science. II. The Federal research and development budget, fiscal years 1952 and 1953. Washington, D. C., U. S. Government Printing Office, 1953.

(4) Weiss, P.: Medicine and society; The biological foundations. J. Mount Sinai Hospital 19: 716–733 (1953).

(5) U. S. National Science Foundation: Annual report, 3d, fiscal year 1953. Washington, D. C., The Foundation, 1953.

(6) U. S. National Science Foundation: Federal funds for science. I. Federal funds for scientific research and development at nonprofit institutions 1950–51 and 1951–52. Washingon, D. C., U. S. Government Printing Office, 1953.

Departmental Appointments

Roswell B. Perkins took office as Assistant Secretary of Health, Education, and Welfare on March 16, 1954. Mr. Perkins, as one of the two Assistant Secretaries of the Department, will be responsible for continuing analysis and review of the programs operated by the Department and its five major component agencies. He will also assist in the presentation of the Department's legislative program during the 1954 session of the Congress. Mr. Perkins was associated with a New York law firm for 4½ years following his graduation from Harvard Law School and admission to the Massachusetts and New York State bars in 1949, and in 1950 he served as assistant counsel to the Senate Committee to Investigate Organized Crime in Interstate Commerce. He joined the Department of Health, Education, and Welfare in September 1953 as a consultant to the Secretary on legislative matters.

Victor Christgau was sworn in as director of the Bureau of Old-Age and Survivors Insurance, Social Security Administration, February 8, 1954. He had served as commissioner of the Minnesota Department of Employment Security since 1939. From 1933 to 1938 he was administrator of the Minnesota Works Progress Administration. He was a member of the United States House of Representatives from 1929 to 1933.

James Francis Kelly, formerly director of the budget branch of the Public Housing Administration, has been named budget officer of the Department of Health, Education, and Welfare. He succeeded Marion A. Stephens who retired March 1, 1954.

Mosquito Distribution and Abundance

in the

Arkansas-White-Red River Basins

By TRAVIS E. McNEEL, B.S., and FREDERICK F. FERGUSON, M.S., Ph.D.

THE STUDY reported here was undertaken to consolidate and amplify information on distribution and abundance of mosquitoes in the Arkansas-White-Red River Basins. These data are essential for planning programs to alleviate health and nuisance problems caused by mosquitoes. Historically, mosquito-borne malaria, encephalitis, yellow fever, and dengue have been hazards adversely affecting the public health and economy of the general area. At present, malaria is a notable potential problem while the problem of encephalitis is seasonally recurrent. The great majority of area mosquitoes are biting pests and severely affect man and animals in certain basins. The increasing development of western water resources projects has intensified existing problems and enhanced the possibility of others developing. Of primary concern is the relation of water resources projects to production of *Culex tarsalis*, the principal vector of encephalitis. Various mosquito pest species are also of special concern in certain areas, as for example, the rice-growing regions of Arkansas and Louisiana.

The mosquito fauna is quite varied in the States where the Arkansas-White-Red River Basins are located: Arkansas, Colorado, Kansas, Louisiana, Missouri, New Mexico, Oklahoma, and Texas. The area distribution of mosquitoes is markedly affected by geographic factors, especially topography and meteorology. The Arkansas-White-Red River area extends from the alpine habitats of Colorado and New Mexico through the plains country of Texas, Oklahoma, and Kansas into the rolling hills and piedmont zones of Arkansas and Missouri and the lowlands of Louisiana. Scarce precipitation characterizes the semiarid western reaches of the territory where in some parts the average annual rainfall is 8 inches. There is heavy rainfall in the eastern sections where some localities may receive an average of 64 inches a year. The annual rate of evaporation varies generally from east to west, from 55 inches to about 114 inches. Soil types and vegetative growth also vary widely throughout the area.

The approximate mosquito-breeding season for Arkansas-White-Red Basins of the western-

Mr. McNeel, who is chairman of the Mosquito Control Work Group of the Arkansas-White-Red River Basins Interagency Committee and a public health entomologist with the Communicable Disease Center of the Public Health Service, is assigned to the Lower Mississippi and Western Gulf Drainage Basins Office at Little Rock, Ark. Dr. Ferguson is also a public health entomologist from the Communicable Disease Center assigned to the Mosquito Control Work Group of the Interagency Committee to work on mosquito control and allied problems.

most States, Colorado and New Mexico, is June–September, while the period of May–October generally covers the season for northern Louisiana and Arkansas. The period of June–September is the approximate mosquito season in southern Missouri. There is a striking gradient in densities of *C. tarsalis* in the area studied; this species is abundant in the western portion and scarce in the eastern portion of the basins.

Density and Distribution

The records summarized in the table are from published reports and recent unpublished observation of larval and adult mosquitoes. Species, distribution, and abundance of mosquitoes are listed by States. The "Relationship to Man and Animals" column refers to species known to be vectors of disease or to species from which an etiologic agent has been isolated. Pest species are designated by biting ferocity and distribution. Species that occur locally in small numbers or that do not feed on man or higher animals are considered unimportant.

In this report, no attempt is made to arbitrate taxonomic problems; however, the species designations comply with generally accepted nomenclature. The following is a clarification of certain points:

Anopheles occidentalis is generally considered to be a Pacific coast species, and early records of its occurring in Colorado are referrable to *Anopheles earlei.*

Aedes alleni is presently known as *Aedes zoosophus. Aedes lateralis*, *Aedes gonimus*, and *Aedes hisuteron* are synonyms of *Aedes sticticus.* Placing the *Aedes idahoensis* record from Colorado under *Aedes spencerii* has been considered by some taxonomists. *Aedes bimaculatus* reported from Oklahoma has been determined to be *Aedes fulvus pallens.* The Louisiana records for *Aedes dorsalis* are probably errors.

Culex apicalis, long known to workers in the southern United States, is now considered to be *Culex territans* in the southeast United States, as based on minute, but apparently valid distinctions. *Culex inhibitator* is generally thought to be a West Indies species, most United States records being referrable to *Culex erraticus.* Recent studies indicate that *Culex stigmatosoma* is found locally in western Oklahoma although its presence in Colorado has been questioned by some workers.

Deinocerites epitedeus, as reported from Texas, possibly was confused with *Deinocerites spanius.*

The following are recent additions to State records of species distribution: *Anopheles franciscanus*, *Aedes canadensis*, *Aedes increpitus*, *Aedes mitchellae*, *Aedes nigromaculis*, *Aedes trivittatus*, *Culex restuans*, *Orthopodomyia signifera*, *Psorophora confinnis*, *Psorophora cyanescens*, *Psorophora discolor* and *Uranotaenia sapphirina* for New Mexico, and *Psorophora discolor* for Colorado.

The species of mosquitoes indicated below are related to disease transmission:

Anopheles quadrimaculatus, *Anopheles albimanus*, and *Anopheles freeborni* are proved vectors of malaria. *Aedes aegypti* is the vector of yellow fever and dengue fever; *Aedes aegypti*, *Aedes dorsalis*, *Culex pipiens*, *Culex stigmatosoma*, *Culex tarsalis*, *Culiseta inornata*, *Culiseta melanura*, and *Mansonia perturbans* can transmit encephalitis.

Summary

The States in which the Arkansas-White-Red River Basins lie have markedly different biotic environments and support a wide variety of mosquitoes which are represented by 10 genera and 100 valid species and subspecies. The disease-vector and pestiferous characteristics of many species are important factors in the public health and general economy of the area. The tabulation presented indicates the distribution and population density of mosquitoes and the relation of mosquitoes to man and domestic animals in individual States of the Arkansas-White-Red River Basins.

Distribution, density, and importance of 100 species of mosquitoes in the Arkansas-White-Red River Basins States

KEY: I—Abundant and widely distributed. II—Abundant and locally or seasonally distributed. III—Scarce but widely distributed. IV—Scarce and locally distributed. V—Present but abundance unknown. N—New to State records. ?—Identification questionable.

Genera and species	Relationship to man and animals	Distribution and density							
		Ark.	Colo.	Kans.	La.	Mo.	N. Mex.	Okla.	Tex.
Anopheles:									
albimanus	Vector								IV
atropos	Unimportant				II				IV
barberi	do	III		III	II	III		IV	IV
bradleyi	do				II				IV
crucians	Pest	III		IV	I	III	II	II	II
earlei	Unimportant		IV						
franciscanus	do		III	IV			II (N)	IV	IV
freeborni	Vector		III				II		IV
georgianus	Unimportant				II				
pseudopunctipennis	Pest	IV	III	III	IV	IV	II	III	II
punctipennis	do	II	IV	I	I	I	III	II	II
quadrimaculatus	Vector	I	IV (?)	II	I	I		II	II
walkeri	Unimportant	III		IV	II	IV			IV
Aedes:									
aegypti	Vector, Pest	III		IV	I	IV	IV	III	III
atlanticus	Pest	III		IV	I	IV		IV	IV
atropalpus	Unimportant	IV		IV		IV	IV	IV	II
bimaculatus	do								IV
campestris	do		II				V (?)		
canadensis	Pest	II	II	IV	II	IV	V (N)	II	IV
cataphylla	Unimportant		IV						
cinereus	do	IV	IV	IV		IV		IV	
communis	do		IV						
dorsalis	Vector, Pest		II	III	V (?)	III	II	II	II
dupreei	Unimportant	V		IV	II	IV		IV	IV
excrucians	do		IV						
fitchii	do		IV						
flavescens	do		IV	IV		IV			
fulvus pallens	do	V			II			IV	IV
grossbecki	Pest	IV			II	IV			
idahoensis	Unimportant		III						
impiger	do		V						
increpitus	do		III				II (N)		
infirmatus	Pest	II			I	IV			IV
intrudens	Unimportant		IV						
klotsi	do		V						
mitchellae	Pest	V			II		V (N)	V	IV
nearcticus	Unimportant		V						
nigromaculis	Pest	IV	II	II	V (?)	III	II (N)	II	II
pionips	Unimportant		V						
pullatus	do		III						
punctor	do		IV						
riparius	do		V						
scapularis	do								II
sollicitans	Pest	II		IV	I	IV	V	V	II
spencerii	Unimportant	V		IV					
sticticus	Pest	V	III	III	II	I		III	V
stimulans	do		III	IV		IV			
taeniorhynchus	do	II			II				II
thelcter	Unimportant							V	II
thibaulti	Pest	III			II	IV			IV
tormentor	do	V			II	IV		IV	IV
triseriatus	do	III	IV	III	I	II		III	II
trivittatus	do	V	III	III	IV	II	IV (N)	IV	IV
vexans	do	I	II	I	I	I	II	II	I
zoosophus	Unimportant			IV				III	III

Distribution, density, and importance of 100 species of mosquitoes in the Arkansas-White-Red River Basins States—Continued

Genera and species	Relationship to man and animals	Distribution and density							
		Ark.	Colo.	Kans.	La.	Mo.	N. Mex.	Okla.	Tex.
Culex:									
abominator	Unimportant								IV
apicalis	do		IV				IV		
chidesteri	do								IV
coronator	do								IV
declarator	do								IV
erraticus	Pest	III		IV	I	III		III	I
interrogator	Unimportant								IV
nigripalpus	Pest				IV				III
peccator	do	V		IV	II	III		III	V
pilosus	do				II				
pipiens	Vector, Pest	V	III	III		I		III	
quinquefasciatus	Vector, Pest	I		III	I	II	II	III	I
restuans	Pest	III	IV	II	I	II	IV (N)	III	III
salinarius	do	III	III	II	I	II	II	II	II
stigmatosoma	Vector, Pest							IV	V
tarsalis	Vector, Pest	III	II	I	II	III	II	II	I
territans	Unimportant	II		III	I	III		III	III
thriambus	do							IV	II
Culiseta:									
alaskaensis	do		IV						
impatiens	do		III			IV			
incidens	Pest		III				II	IV	IV
inornata	Vector, Pest	II	II	I	I	I	III	II	I
melanura	Vector, Pest	V	IV		IV	IV		IV	IV
morsitans	Unimportant		IV						
Deinocerites:									
epitedeus	do								V (?)
spanius	do								IV
Mansonia:									
perturbans	Vector, Pest	III	IV	IV	II	IV		IV	II
titillans	Pest	V							II
Orthopodomyia:									
alba	Unimportant			IV	IV	IV			III
signifera	do	III		III	II	IV	V (N)	IV	III
Psorophora:									
ciliata	Pest	II		III	I	III		IV	I
confinnis	do	I	IV	II	I	II	IV (N)	II	I
cyanescens	do	II		IV	I	II	V (N)	III	I
discolor	do	II	IV (N)	II	I	III	IV (N)	III	II
ferox	do	II		III	I	III		IV	II
horrida	do	III		III	II	III		IV	IV
howardii	do	III		IV	I	IV		IV	III
longipalpus	do	V		IV	IV	IV			V
mexicana	Unimportant								V
signipennis	Pest	V	III	III		IV	IV	III	II
varipes	do	II			II	IV		IV	IV

Distribution, density, and importance of 100 species of mosquitoes in the Arkansas-White-Red River Basins States—Continued

Genera and species	Relationship to man and animals	Distribution and density							
		Ark.	Colo.	Kans.	La.	Mo.	N. Mex.	Okla.	Tex.
Toxorhynchites:									
septentrionalis	Unimportant	III		IV	II	IV		IV	III
Uranotaenia:									
lowii	do	IV			I				II
sapphirina	do	III		IV	I	III	V (N)	III	II
syntheta	do	V					V	III	III
Total number of species	100	53	46	47	53	51	30	51	72

State Sources of Reports Used in Table

Arkansas

1910 J. K. Thibault. Notes on the mosquitoes of Arkansas. Proc. Ent. Soc. Wash. 12: 13–26.

1937 W. R. Horsfall. Mosquitoes of southeastern Arkansas. J. Econ. Ent. 30: 743–748.

1941 S. J. Carpenter. The mosquitoes of Arkansas. Arkansas State Board of Health.

1942 S. J. Carpenter. Mosquito studies in military establishments in the Seventh Corps Area during 1941. J. Econ. Ent. 35: 558–561.

1943 W V. King, L. Roth, J Toffaleti, and W. W. Middlekauf. New distribution records for the mosquitoes of the southeastern United States during 1942. J. Econ. Ent. 36: 573–577.

1944 G. H. Bradley, R. F. Fritz, and L. E. Perry. Additional mosquito records for the southeastern States. J. Econ. Ent. 37: 109.

1944 W. W. Middlekauf and S. J. Carpenter. New distribution records for the mosquitoes of the southeastern United States in 1943. J. Econ. Ent. 37: 88–92.

1944 H. L. Fellton. The breeding of the salt-marsh mosquito in midwestern States. J. Econ. Ent. 37: 245–247.

1944 W. V. King, G. H. Bradley, and T. E. McNeel. The mosquitoes of the southeastern States. U. S. Department of Agriculture, Misc. Pub. No. 336 (revised).

1946 S. J. Carpenter and W. W. Middlekauf. Mosquitoes of southeastern United States. University of Notre Dame Press.

1947 J. F. Brandenburg and R. D. Murrill. Occurrence and distribution of mosquitoes in Arkansas. Ark. Health Bull. 4 (8): 4–5.

Colorado

1918 T. D. A. Cockerell and J. T. Scott. Culicidae of Colorado. J. Econ. Ent. 11: 387–388.

1918 T. D. A. Cockerell. The mosquitoes of Colorado. J. Econ. Ent. 11: 195–200.

1933 R. Matheson. A new species of mosquito from Colorado. Proc. Ent. Soc. Wash. 35: 69–71.

1942 M. T. James. A two-season light trap study of mosquitoes in Colorado. J. Econ. Ent. 35: 945.

1943 R. W. Portman. New mosquito records for Colorado. J. Kans. Ent. Soc. 16: 155.

1944 T. A. Olson and H. L. Keegan. New mosquito distribution records from the Seventh Service Command Area. J. Econ. Ent. 37: 847–848.

1946 W. R. Lasky. A report of mosquitoes collected at Fitzsimmons General Hospital, Denver, Colorado. Ent. News 57: 188–193, 222–228.

1949 F. C. Harmston. An annotated list of mosquito records from Colorado. The Great Basin Naturalist 9: 65–75.

Kansas

1939 N. DeM. Hill. Biological and taxonomic observations on the mosquitoes of Kansas. Tr. Kans. Acad. Sci. 42: 255–265.

1944 T. A. Olson and H. L. Keegan. New mosquito distribution records from the Seventh Service Command Area. J. Econ. Ent. 37: 847–848.

1944 T. A. Olson and H. L. Keegan. The mosquito collecting program of the Seventh Service Command for 1942–1943. J. Econ. Ent. 37: 780–785.

1951 U. S. Public Health Service. Mosquito records from the Missouri River Basin States. The Surveys Section, Office of Midwestern Communicable Disease Center Services, Kansas City, Kans.

Louisiana

1924 G. E. Beyer. The mosquitoes of Louisiana. Quart. Bull. La. State Department of Health 14: 54–84.

1945 P. H. Harden. The occurrence of Orthopodomyia alba Baker at New Orleans, Louisiana. Mosquito News 5: 131.

1947 W. W. Wirth. Notes on the mosquitoes of Louisiana. J. Econ. Ent. 40: 742–744.

Missouri

1942 S. J. Carpenter. Mosquito studies in military establishments in the Seventh Corps Area during 1941. J. Econ. Ent. 35:558–561.

1942 H. W. Poston and M. M. Brooke. Report on malaria survey along the upper Mississippi River. Pts. I and II. Board of State Health Commissioners, Upper Mississippi River Basin, Des Moines, Iowa.

1943 A. B. Gurney. A mosquito survey of Camp Crowder, Missouri, during 1942. J. Econ. Ent. 36 :927–935.

1943 C. F. Adams and W. M. Gordon. Notes on the mosquitoes of Missouri (Diptera, Culicidae). Ent. News 54: 232–235.

1943 M. F. Day. Report on mosquitoes collected in St. Louis County during 1942. Tr. St. Louis Acad. Sci. 31: 29–45.

1944 T. A. Olson and H. L. Keegan. New mosquito distribution records from the Seventh Service Command Area. J. Econ. Ent. 37: 847–848.

1944 H. L. Fellton. The breeding of the salt-marsh mosquito in midwestern States. J. Econ. Ent. 37: 245–247.

1944 T. A. Olson and H. L. Keegan. The mosquito collecting program of the Seventh Service Command for 1942–1943. J. Econ. Ent. 37: 780–785.

1951 U. S. Public Health Service. Mosquito records from the Missouri River Basin States. The Surveys Section, Office of Midwestern Communicable Disease Center Services, Kansas City, Kans.

New Mexico

1929 M. A. Barber, W. H. W. Komp, and C. H. King. Malaria and the malaria danger in certain irrigated regions of the southwestern United States. Pub. Health Rep. 44: 1300–1315.

1933 M. A. Barber and L. R. Forbrich. Malaria in the irrigated regions of New Mexico. Pub. Health Rep. 48: 610.

1939 M. A. Barber. Further observations on the Anopheles of New Mexico. Am. J. Trop. Med. 19: 345–356.

1952 T. E. McNeel and F. F. Ferguson. Psorophora cyanescens (Coquillet) new to the mosquito fauna of New Mexico. Mosquito News 12: 241.

1954 F. F. Ferguson and T. E. McNeel. The mosquitoes of New Mexico. Mosquito News. (In press.)

Oklahoma

1942 L. E. Rozeboom. The mosquitoes of Oklahoma. Okla. Agri. & Mech. Col. Agri. Exper. Sta. Bull. T–16.

1944 H. L. Fellton. The breeding of the salt-marsh mosquito in midwestern States. J. Econ. Ent. 37: 245–247.

1945 L. M. Roth. The male and larva of Psorophora (Janthinosoma) horrida (Dyar and Knab) and a new species of Psorophora from the United States. Proc. Ent. Soc. Wash. 47:1–23.

1951 E. J. Hinman. A preliminary study of mosquitoes at Lake Texoma, Oklahoma. Proc. Okla. Acad. Sci. 31: 51–52.

1952 M. E. Griffith. Additional species of mosquitoes in Oklahoma. Mosquito News 12: 10–14.

Texas

1940 F. W. Fish and J. H. Levan. Mosquito collections at Brownsville, Texas. J. Econ. Ent. 33: 944.

1943 R. B. Eads. A description of the larvae of Culex abominator. Dyar and Knab. J. Econ. Ent. 36: 336.

1943 T. McGregor and R. B. Eads. Mosquitoes of Texas. J. Econ. Ent. 36: 938–940.

1944 K. O'Neill, L. J. Ogden, and D. E. Eyles. Additional species of mosquitoes found in Texas. J. Econ. Ent. 37: 555–556.

1944 Texas State Health Department. The mosquitoes of Texas.

1945 D. C. Thurman, L. J. Ogden, and D. E. Eyles. A United States record for Culex interrogator. J. Econ. Ent. 38: 115.

1945 C. R. Joyce. The occurrence of Psorophora mexicana (Ballardi) in the United States. Mosquito News 5: 86.

1946 R. B. Eads. A new record for Anopheles albimanus Wiedemann in Texas. J. Econ. Ent. 39: 420.

1948 C. R. Joyce. Culex chidesteri (Diptera, Culicidae) at Brownsville, Texas. Mosquito News 8: 102–105.

1948 O. P. Breland. Notes on the mosquito Uranotaenia syntheta Dyar and Shannon (Diptera: Culicidae) Mosquito News 8: 108–109.

1949 O. P. Breland. Distinctive features of the larvae of Aedes alleni Turner (Diptera: Culicidae). J. N. Y. Ent. Soc. 57: 93–100.

1950 R. B. Eads and G. C. Menzies. Distribution records of Mansonia Blanchard (Diptera, Culicidae) in Texas. Mosquito News 10: 3–5.

1950 M. E. Rueger and D. Stennette. New mosquito distribution records for Texas. Mosquito News 10: 60–63.

1951 R. B. Eads, G. C. Menzies, and L. J. Ogden. Distribution records of west Texas mosquitoes. Mosquito News 11: 41–47.

ideas

Typhoid Tracer Technique

MONROE COUNTY, N. Y. The source of sporadic cases of typhoid fever in the vicinity of Spencerport was sought by laboratory procedures used, it is believed, for the first time in this country, according to the December 21, 1953 issue of the *Bulletin*, published by the New York State Department of Health.

Robert W. Bacorn, district health officer of the area, employed the technique for stream and sewage pollution study when the repeated use of usual epidemiological investigations failed to locate the contaminating agent of stream water drunk by the typhoid victims.

Swabs impregnated with selective culture media were placed for several days in the sewage effluent of Spencerport where it discharged into the stream. Laboratory examination of the swabs identified typhoid bacilli of the same bacteriophage type as had been recovered from each of the typhoid cases. This evidence established the village as a likely source of the typhoid bacilli.

By planting swabs through the sewerage system, a single block of the town was identified as harboring the carriers. Within this block, the investigation centered on a convalescent home.

Through stool specimen examinations, 3 of the 18 occupants of the home were found to be carriers of the bacilli type that had been responsible for the typhoid cases. Further investigation aimed to determine whether these persons were chronic carriers.

Well Drilling and Latrine Construction In Rural Burma

By CLARENCE J. FELDHAKE, C.E.

BURMA'S PLANS for improving the quality of the drinking water supply began to materialize in 1952 when a hand pump tube well was drilled in one of the villages. A group of government officials, on an inspection tour in the area, viewed the well, and on the basis of their report, the Prime Minister requested that the rural well drilling project, planned at first on a modest scale, be extended to all the States in Burma.

The well drilled in Taukkyan, a village of 500 families about 20 miles northeast of the capital city of Rangoon, was the first drilled installation to be completed in Burma's new environmental sanitation program, organized and operated through the first 2 years with the assistance of public health technicians from the United States.

Before the United States sent the technical assistance mission to Burma, the Directorate of Medical and Health Services, Burma's national health agency, did not have a sanitary engineer on its staff nor environmental sanitation in its program. A division of environmental sanitation and sanitary engineering, created on the recommendation of the mission, is now established in the health agency. The rural well drilling and latrine construction project, planned with the mission's aid and initially financed with matching Union of Burma and United States funds, is proceeding under Burmese direction with funds appropriated by Burma.

But before the first well could be drilled and the first latrine constructed, the need had to be assessed, the project plans presented and approved, and an administrative agency organized. The equipment had to be assembled, part of it from the United States and part from Burma. Much of the drilling equipment had to be adapted to local geologic formations. Probably most important, a health education program had to accompany the well and latrine construction phases to obtain acceptance by the villagers.

Assessment of the Need

A survey of the general living conditions in Burma was the first step. In the spring of 1951, at the request of the Burmese Ministry

---

Mr. Feldhake completed in May 1953 a 2-year assignment as chief sanitary engineer with the United States technical cooperation mission in Burma. Recently, he was assigned to a similar mission in Afghanistan with the Foreign Operations Administration, which administers all the technical assistance programs of the United States. In previous assignments, Mr. Feldhake, commissioned as a sanitary engineer in the Public Health Service Reserve Corps in 1942, has assisted in the Department of Agriculture's housing project for foreign agricultural workers in New England and the Atlantic Coast States and in Oklahoma's malaria control program. In 1948–51 he was assigned to the Bureau of Indian Affairs to assist in setting up an environmental sanitation program on the Navajo Indian reservation.

---

of Social Services, some 20 United States health specialists were sent to Burma to survey the health needs of the country and recommend projects. (The program was administered in turn by the Economic Cooperation Administration, the Mutual Security Agency, and the Technical Cooperation Administration. All have now been succeeded by the Foreign Operations Administration.)

The specialists visited representative cities, villages, and rural areas to survey environmental conditions, such as water supplies, sewage disposal, and public food markets, and to assess the need for such facilities as hospitals and health centers.

The environmental sanitation program is one of the four major projects that developed from the survey findings. Burma is also conducting hospital construction, malaria control, and health education programs.

The mission found that safe water supplies and municipal sewerage systems were virtually nonexistent in Burma, even in the cities.

Rangoon, with a population of about 750,000, obtained its main water supply from a large lake about 40 miles north of the city. This supply was piped into the city and was chlorinated at the point where the main pipe lines entered the system of distributing mains. Frequent tests at various places in the city at no time showed any residual chlorine.

Pressure was maintained in the system for only about 16 hours a day. Use of water stored in unsanitary tanks installed in the top floors of the better homes and office buildings and the possibility of back siphonage in the pipes from these supplies when the pressure was off created a constant health hazard.

Three or four of the next largest cities in Burma had a piped water supply in which the conditions were similar to or worse than those in Rangoon.

There were no municipal sewage treatment plants in the entire country, and Rangoon was the sole city with a sewerage system. It served, however, only about 10 percent of the population. Most of the government units, such as the hospitals and the central government buildings, and many private homes had septic tanks, with the effluent discharging into nearby ditches or streams.

In the rural areas the villages depended on shallow dug wells, ground tanks, ponds, and nearby streams for their water supplies. A few of the dug wells were capable of supplying potable water, but most of them were so poorly constructed that it was impossible to protect them from surface and underground contamination.

The alternate dry and rainy seasons in Burma increase the hazards of water supply contamination. During the monsoon from mid-May to mid-October, when the total rainfall ranges from 90 to 200 inches, there is heavy surface contamination. The dry season, from February through April, usually ends with a water shortage because of the shallowness of the dug wells and the heavy use of water from the surface tanks. Water from ponds, drying-up streams, or other surface sources is used.

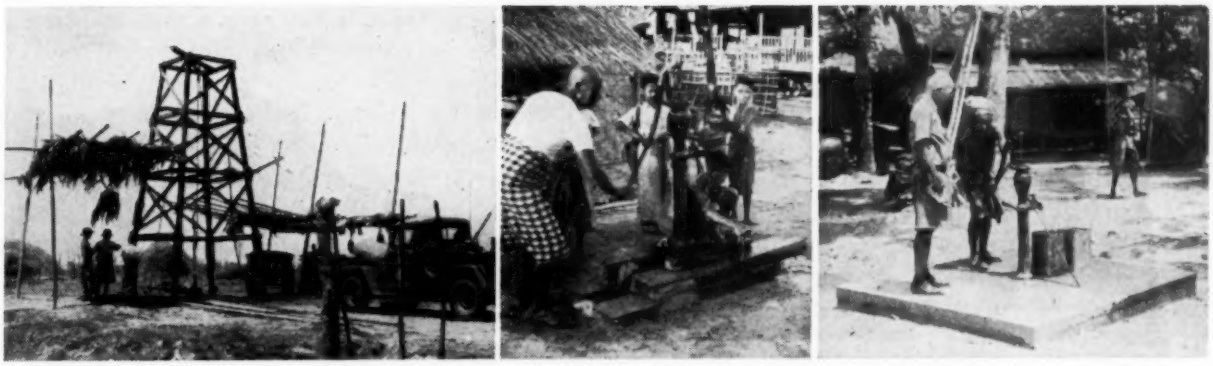
The extremely poor excreta disposal in the villages was a major factor in water contamination. In some villages, no more than 10 percent of the families had latrines—the nearby jungle being much more convenient and less trouble than the construction and maintenance of a latrine.

The mission estimated that in the rural areas about 40 percent of the children die before they reach the age of 6 years. The high mortality rate among adults from waterborne diseases, such as typhoid, diarrhea, and dysentery, also reflected the unsanitary surroundings and lack of healthful drinking water.

Organization

As a first project in environmental sanitation the mission recommended that a well drilling and latrine construction program be carried on in the rural areas of Burma. Burmese crews were to be trained in the techniques of tube well drilling and of the installation of deep well hand pumps as the wells were drilled. The villagers were to construct latrines with tools and concrete squat slabs supplied by the program.

Administering the program was the new environmental sanitation division, set up within



Left: One of the wells in Burma project in drilling stage, at this time about 230 feet deep. Drilling rig in right foreground is used for raising and lowering the jetting pipe. Shade mats on the teakwood derrick protect workmen from the sun. Center: Villagers getting water from a well before the concrete platform was installed. Right: Completed well used constantly by about 50 village families, who formerly had to carry water a quarter of a mile.

the health agency. The health education division carried on the necessary health education work connected with the well drilling and latrine project. American technical advisers headed the divisions until Burmans could be trained for the positions.

Existing governmental authorities in Burma cooperated in the rural sanitation program. The Ministries of Defense, Education, and Construction, and the Directorate of Medical Health Services were kept informed about the plans by the Ministry of Social Services, which had approved the program. In the operational phases, district officials and village headmen were consulted about details of the project and took part in the work. The 6 States of Burma are each divided into 6 to 10 districts, each with a district commissioner responsible for practically all the governmental activities in his district. Under him are various deputy district commissioners. And in each village is a headman, although one headman may act for several small villages. The headman acquires his status by right of seniority and speaks for the villagers in all matters.

Selection of Project Sites

The unsettled political conditions in some of the districts in Burma narrowed the selection of project sites. Insurgent factions were continually waging war on each other and on the Government. The districts on the eastern border were especially subject to guerrilla raids. In this state of fluid warfare the project had to be conducted within the protective range of the Union of Burma Army. Through the Ministry of Defense, the mission was kept informed about the areas in which security was being maintained and the work could be done without endangering the lives of the crewmen or the risk of property loss or damage.

The second consideration was the selection, from the safe areas, of villages in which the water supply was recognized as a health hazard.

Three districts, Insein, Hanthawaddy, and Pegu, within a radius of 50 miles of Rangoon, were chosen for survey to determine in which of the numerous villages the work should be started. There were about 40 villages in this area, ranging in size from 100 to 1,000 families.

A questionnaire was used in obtaining as much pertinent information as possible about the type and use of the water supply in the community, the number of latrines, and the morbidity and mortality rates. Among the items on the questionnaire were:

Tube wells. Number in the community, size, depth, condition, and yield.

Dug wells. Number, depth, construction, condition, protection from contamination, and distance from latrine.

Surface water supplies. Source—ground tanks, lakes, or streams—type of use, condition during dry season, and the number of families using each source.

Latrines. Number of dwellings with latrines, type, condition, and type most acceptable.

The questions on health sought information on the number of families and number of per-

sons in the community; the number of deaths during 1950 and 1951 among infants up to 1 year and children up to 5 years of age; and the number of cholera, typhoid, diarrhea, and dysentery cases and deaths from these causes among the villagers during the same years.

Personnel from the offices of the three district commissioners made the survey, filling in the questionnaire with information they received in interviews with the local health officers and the village headmen.

Drilled wells were allocated to villages in which the data indicated high sickness and death rates attributable to waterborne diseases and lack of adequate water supplies. The information was also to be used in a future survey, after the wells had been installed and used for several years, as a base from which to determine whether the improved water supplies and excreta disposal had helped improve the health of the villagers.

Each drilled well was to supply 70 to 80 families with water for drinking and cooking. The number of wells allocated to a village was determined on this basis. Burmans use large quantities of water for personal bathing and clothes washing, and they were expected to continue to use the dug wells and surface tank supplies for these purposes and for watering livestock and for fire protection.

Typical of the villages selected were Taukkyan, in the Insein District, allotted 6 drilled wells, and Dayebo, in the Pegu District, in which 2 wells were to be drilled. Taukkyan had a high death rate from waterborne diseases, the dug wells were in poor condition, and there was a definite water shortage during the dry season. Similar conditions existed in Dayebo, a village of about 150 families, 10 miles from Taukkyan. During the dry season water had to be hauled several miles.

Eighteen additional wells were approved for villages in the Pegu District as crews became experienced and equipment available, 10 of them in Hlegu, operational headquarters for the district.

Method of Well Construction

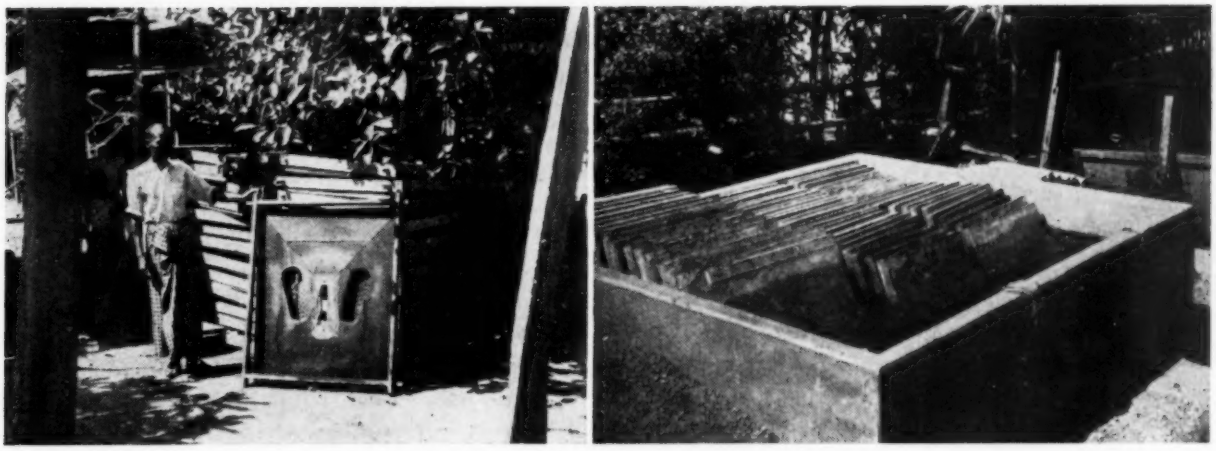
Little or no well drilling had been done previously outside of a 10-mile radius of Rangoon. In fact only one drilled well was found in the three districts surveyed—a 30-year-old well in Hlegu badly in need of repairs. Although no detailed information was available on the geologic formation of the underground strata in the area, the experience of the Rangoon well drillers, a test well at Aung San, and the general topography indicated an underlying stratum of sedimentary origin in southern and central Burma.

The 4-inch diameter, medium-depth tube well was selected for installation. This type, it was believed, would supply enough potable water for 70 to 80 families in the villages. And the jetting method of well drilling, used in Burma, was selected as the most practical and economical technique for drilling through an underground formation that had no hard rock, shale, or clay. This method follows:

A steel well casing pipe is started into the ground. Inserted into the casing is a 1½-inch to 2-inch pipe which carries water under high pressure against the formation ahead of the casing. The casing has some 400 ⅜-inch perforations in the first 5 feet and a toothed cutting edge at the head of the pipe. The jetting water pipe, which has a fishtail head and sharpened vanes, is rotated, raised, and dropped, thus loosening the material ahead of the pipe. As this material is washed up and out of the well casing, the workmen rotate the casing with chain tongs or long pipe wrenches.

Equipment used by the project for this type of drilling consisted of:

1. A wood derrick about 30 feet high. This derrick, made of teak, had to be sturdy since at times a heavy strain was placed on it to raise pipe that had become frozen in the clay strata. It was constructed so that it could be taken down easily and reassembled at a new location.
2. Two gasoline operated centrifugal water pumps. One is used for jetting enough water under great enough pressure to carry the different types of underground cuttings up and out of the casing at depths of 200 feet. The other is used to pump water to the jetting pump from the sump in which used water is collected or from an auxiliary source.
3. Two hundred feet of 1½-inch or 2-inch heavy pipe for the jetting, cut to 12-foot lengths for easier handling. Thirty-five feet of 2-inch armored hose for use in lowering pipe into the well hole.
4. Four-inch standard well casing cut to 12-foot lengths and rethreaded, with a coupling for each length. Smooth surfaced couplings are required since they offer a minimum of resistance as the well casing is forced down into the jetted hole. One of these



Left: Teakwood forms used for making the concrete squat plates in the latrine construction program. Right: Curing tank for latrine squat plates in which plates are submerged in water for 10 to 12 days after they have set for about 4 days.

couplings has cutting teeth and is used as the cutting edge of the first pipe.

5. An air compressor of about 60 to 70 cubic feet per minute capacity able to maintain a maximum pressure of 200 pounds per square inch.

6. Two hundred feet of 1-inch galvanized pipe to be used as the air induction pipe. This requires an eductor pipe. The 1-inch air pipe is given a U bend into a 2-inch pipe and the unit lowered length by length into the drilled well hole and 4-inch casing. The air under pressure rising in the pipe carries the water up out of the well. This pipe is used after the water bearing strata has been reached and the water is standing in the casing about 15 to 30 feet from the surface of the ground.

Each installation was fitted with a hand pump of the type usually installed on individual farm wells in the United States, and a concrete well platform was constructed.

The drilling rigs originally sent to Burma for the project were augering machines designed for drilling through soft rock formations and dense clay and were of little use in the area. The auger advanced through the semiliquid clay, and sand and clay, with comparative ease, but as it was withdrawn the hole filled with the material. However, some use was made of the rigs in drilling a preliminary hole and in placing and handling the casing on the derrick.

There were no supply houses in Burma which stocked the odds and ends of equipment necessary for well drilling. The cutting heads, pipe clamps, jetting nozzles, and a variety of other items had to be made in the local machine shops. Specifications were drawn up for such pieces, and the machinists were shown how to make them.

Starting as the mission did from scratch, the first well took about 3 months to complete. But during the construction of this first well, the main problems of drilling method, equipment assembly and adaptation, organization for operation, and training procedures were solved for the area. Subsequent wells could be completed in about 2 weeks.

Installation of wells in the Shan and Kachin States to the north and in the eastern area required other methods. Two heavy cable and two rotary type well drilling rigs were ordered as a start toward extending the program into such areas. The Burmese Government also expected to develop better water supplies for the larger communities and cities after the rural needs were filled. And these rigs could be used to drill large-diameter wells of 6, 8, and 10 inches, capable of yielding an adequate water supply for a larger population.

Training of Crews

The first crew consisted of the foreman and 8 workers, all Burmans, who had some experience with the method of tube well drilling used in the area. Working with this crew was a secondary crew of 8 men who were to be trained in the proper use of the machinery and equipment. When the second crew obtained enough experience to work independently of the first

crew, it was equipped for drilling and assigned to a well project. Each experienced crew was assigned 8 more workmen to train. As the new crews became proficient in the work, usually during the drilling of 3 to 4 wells, they in turn were outfitted and assigned to drilling jobs in other localities.

Supervising the drilling operations in the field were the chief well driller and three assistant well drillers. It was also their job to keep the crews supplied with equipment for drilling and for the installation of pumps as the wells were completed.

The equipment for each crew included:

1 heavy truck; 1 pickup truck; 1 air compressor, serving 3 crews; 2 jetting gasoline operated centrifugal water pumps or displacement pumps; and miscellaneous items such as wrenches, jetting nozzles, swivel heads, water hose, air hose, and pipe clamps.

By May 1953, 4 completely outfitted crews were drilling and 4 crews were in training. The objective of the program was to have 25 completely trained and equipped crews working in the field. Enough equipment had been ordered to outfit that number of crews within the following year.

Latrine Construction

Proper excreta disposal necessarily accompanies a safe water supply. The existing sanitary conditions observed and the information obtained from the survey questionnaire made it evident that disposal of human excreta was going to be a major sanitation problem. Surveys of the various villages had shown that the bored hole latrine was acceptable, but the villages had few bored hole or pit latrines. The earlier construction of a model latrine in some of the villages had little or no effect in inducing the other villagers in the same community to construct their own units.

It was essential that the environmental sanitation division conduct a latrine construction program simultaneously with well drilling if the program was to have a widespread effect in the control of disease.

The bored hole type of latrine was selected for installation. The latrine holes, about 20 feet deep, were bored with 16-inch augers. The reinforced concrete slab squat plate, designed for the project, was similar to the type of plate being used throughout Burma and in the rural sanitation work in India, Iran, and other countries. The slab, generally 2½ feet wide by 3 feet long by 2½ inches thick, sloped toward a 4-inch by 14-inch slot at the center. Two raised foot plates were properly located.

The villagers drilled the holes under the supervision of a district sanitarian or other person trained in the work so that the latrines were properly constructed and located. The augers were lent them by the rural sanitation agency and the project contributed the squat plates.

Funds were approved by the Burmese Government for the labor and materials used in the latrine project. A crew was hired to make the squat plates, and the necessary cement, sand, gravel, and reinforcing mesh were provided. Four carpenters were hired to make the forms used in casting the plates. Since it would require 4 to 5 days for the concrete to harden in the forms, 100 forms were needed to produce 25 plates each working day.

As the program progressed manufacturing facilities were enlarged to increase production of the plates, and 300 standard latrine augers were ordered to supplement the 100 on hand.

By May 1953, about 1,500 plates had been completed and several hundred more would be ready for delivery after a 2-week curing period. Eight hundred latrines had been constructed.

Health Education Program

Acceptance by the villagers of a sanitary type of latrine and cooperation in its construction, maintenance, and proper use was necessary to the program. To insure this cooperation, a rural sanitation and health education program was conducted in each of the villages in which the wells were being drilled.

Arrangements for the program were made by the health education division, and a representative of the division was assigned to the project.

The Mass Education Organization, set up by the Ministry of Education in Burma to promote better living conditions among the rural population, was instrumental in assisting the health education division with the work among the villagers.

In each village where the wells were to be drilled, the health educators met with the village headman and the elders to explain the purpose of the program and to point out that if the village was to obtain wells, it would be necessary for the villagers to drill the latrine holes and erect the superstructure, usually made with bamboo posts and bamboo matting. The headman and village council appointed a health and sanitation committee, made up of leading citizens in the village, to promote the project. In one village a wheelwright, who made bullock carts, a school teacher, two shopkeepers, and a midwife were on the committee. The committee members, supplied with information and placards, were able to explain the project to their fellow villagers much better and gain more support for it than could the health educators.

At general meetings of the villagers, cartoon films and flip charts showed how water is contaminated and the health benefits of pure water. A film entitled "The Tale of Two Villages" was also made during the project to demonstrate how a village could obtain a well. A public demonstration of the proper method of drilling the bored hole latrine, the mounding of dirt around the latrine, and the construction of the superstructure was an important feature of the education program.

Progress

At the time the first well was started, November 1952, the latrine manufacturing crew was also assigned to Taukkyan to make squat plates. The village headman had been informed of the plans and preliminary health talks had been given to the villagers. All of them agreed to construct latrines as fast as the squat plates were available.

During the following 3 months the 6 wells at Taukkyan and the 2 at Dayebo were completed. The latrine construction program was going ahead faster than the well drilling program. Numerous villages in the vicinity were sending delegations to obtain squat plates with the agreement that they would construct proper latrines throughout their villages. Every effort was made to meet these requests, even for villages in which no drilled wells were planned.

After completion of the first well, the Prime Minister formed a Rural Water Supply and Environmental Sanitation Board to plan for the extension of the rural well drilling and latrine construction program to all of Burma. Members of the board were the Ministers of Social Services, Education, Defense, Housing, and Finance, the Director of the Mass Education Organization, and the Technical Cooperation Administration medical chief and chief sanitary engineer.

At the May 1953 meeting of the board, it was announced that the cabinet had approved the revised program plans. An appropriation of 1,500,000 rupees ($315,000) from the Burmese treasury, not from counterpart funds, had been approved. And 500,000 rupees ($105,000) had been deposited for continuing the program.

Venereal Disease Conference for Nurses

A working conference for nurses on the public health aspects of venereal disease control will be held May 10–15, 1954, in Chapel Hill, N. C., under the sponsorship of the University of California School of Public Health, the North Carolina State Board of Health, and the Public Health Service.

The purpose of the conference is to provide current information related to the changing concepts and newer developments in venereal disease control. It is open to public health nurses, supervisors, and instructors in schools of nursing in the southeastern United States. For further information regarding applications and costs, contact the director of public health nursing in your State health department. A limited number of scholarships are available. All applications must be in by May 1.

Self-Survey of Health Facilities In Auburn, Massachusetts

By MARGARET H. BLUTE, M.S.

ARE DOOR-TO-DOOR community health surveys of any real value? Is the survey conducted by relatively untrained, inexperienced, but interested people in the community worth the time and effort on the part of professional consultants—not to mention the citizen effort—that such a project demands?

In replying to these questions, the objectives of a health survey should first be considered. If the main objective is to discover facts relating to the status of health in the community, a self-survey may be of questionable value. If, on the other hand, the main objective is to bring about an awareness in the citizens of health needs currently not being met and to create an active desire on their part to do something to meet those needs—in other words, if the main objective is health education, then a self-survey can be very effective.

Origin of the Survey

Such a survey was held in Auburn, Mass., in June 1952. The decision to conduct the survey was made by a handful of people as a result of a negative reaction to a law regarding local public health services. This law was passed in 1949 by the Massachusetts Legislature and was known as the Union Health Department Law.

The law required that all towns with a population of less than 35,000 meet minimum standards as defined by the Massachusetts Public Health Council or join with their neighboring towns to organize and support a "Union Health Department" within a period of 10 years. The use of the word "union" complicated education on the law; in a substitute law, the 1953 legislature changed the term to "Regional Health Districts."

Auburn, like every other independent town in Massachusetts, felt that it was already providing adequate public health services and that regional health departments were unnecessary, expensive, and a threat to the long-cherished New England tradition of home rule. The town was particularly anxious to retain its local autonomy since it had just succeeded in withdrawing from a school union with a neighboring town. This union had been unsatisfactory to Auburn for many years, and the fact that it took an act of the Massachusetts State Legislature to dissolve the school union made townspeople doubly apprehensive of joining any other kind of union. Furthermore, just prior to initial discussions of the Union Health Department Law, improvements had been made in the inadequate school facilities in the town at considerable expense to the taxpayers, and the possibility of another increase in the tax rate was most alarming.

Background of the Town

Auburn, with a population of 8,838 persons (1950) is essentially a residential community.

Mrs. Blute is a health educator in the Massachusetts Department of Public Health.

It is located 6 miles from Worcester, a large industrial city of over 200,000 population, and its residents are for the most part white-collar workers employed in Worcester. Responsibility for the public health is vested in a three-man, part-time board of health, elected at the annual town meeting, and required by State law to meet at least once a year. A full-time school nurse is employed by the town school committee, a part-time nurse by the board of health, and a full-time visiting nurse by the local voluntary nursing association. One of the two physicians residing in Auburn serves as school physician, in addition to being a member of the board of health.

In the nearby city of Worcester, the services of pediatricians, dentists, and other specialists can be readily obtained. The nine hospitals in Worcester are available to Auburn residents. Auburn's population has increased considerably during the last 10 years because of its easy accessibility to Worcester by public transportation. The increase in building has brought many problems, among them an acute need for public sewers.

Citizens Committee for Public Health

When the Union Health Department Law was passed, a statewide Citizens Committee for Public Health was formed. This State committee conducted its meetings on a regional basis to facilitate study of the legislation and to plan an educational program in the specific communities of the region. The objective of the committee was to bring about an awareness of the need and value of full-time local health departments.

One of the two practicing physicians in Auburn was a member of this committee, but was usually too busy with his practice to attend the regional meetings. He was genuinely interested, however, and asked the school nurse to represent him on these occasions. She became a very active member of the committee in her own right.

The State committee met in Auburn in October 1951. Many local organizations had sponsored individual health projects in the past, but no cooperative effort had been tried. Now, stimulated to action by the threat of a compulsory health union in 10 years, it appeared that the people of Auburn were prepared to examine their own health services.

The Auburn Health Council

Following the Auburn meeting of the Massachusetts Citizens Committee for Public Health, two persons who had attended that meeting decided to try to form a health council to continue study of the Union Health Department Law locally. These were the school nurse, who was a committee member, and a member of the District Nursing Society. They invited a health educator from the Massachusetts Department of Public Health who was currently working in the district office in Worcester to help them form the council.

The health council held its first meeting in December 1951, with the school nurse acting as temporary chairman. All voluntary organizations in Auburn—the Rotary Club, Parent Teachers' Association, Red Cross, Garden Club, church groups, and District Nursing Society—as well as official agencies, such as Civil Defense, the Board of Selectmen, and the Board of Health, were invited to send representatives to this meeting.

The first meeting of the group was most productive. A short talk about the organization and functions of health councils was followed by a discussion of the Union Health Department Law as a specific health matter which needed the attention of an organized health council. Reactions to the implications of the Union Health Department Law were intense and demonstrated the need for additional meetings on the subject to clarify misconceptions and to decide on what action, if any, the group wished to take. As a first positive step, each person present was offered a list of persons qualified to speak on this law, with the suggestion that the list be presented to the parent organizations to aid them in obtaining speakers for worthwhile programs for future meetings.

As a result of this action by the health council, at least three groups requested speakers from the Massachusetts Department of Public Health. Thus, before the community self-survey began, some of the townspeople were

reached by health education programs and were giving some thought to local public health.

Another outcome of this first meeting was that the health council requested the board of health to have included in the warrant for town meeting an article asking for the appointment of an official town committee to study the Union Health Department Law. As a result, a Union Health Department Committee was appointed at town meeting in March 1952.

The second health council meeting, held in January 1952, brought the group no nearer formal organization, but it also could be called a useful meeting. A discussion of the minimum standards tentatively approved by the Massachusetts Public Health Council as a measure of local public health services brought out the adequacy of Auburn's health services and the excellent health status of the residents generally. However, as the discussion proceeded, the group gradually realized that the statements made were not justified—the facts were not really known. Each member, therefore, took home from the meeting a copy of the tentative minimum standards to study carefully and prepare suggestions to be presented at the next meeting. After further discussion, there was a unanimous decision to conduct a door-to-door survey of the health status of the residents of Auburn.

An important factor in the health council's willingness to undertake the necessary organization and the actual legwork involved in a door-to-door survey was the failure of a survey made several years before to determine the immunization status of children. At that time, the Auburn Board of Health was considering discontinuance of immunization clinics because it was felt that mothers were taking their children to the family physician for their immunizations. The board of health and the school nurse made the survey by mail, but obtained little information. Perhaps the response would have been better if there had been greater community participation in planning the survey.

The health educator from the Massachusetts Department of Public Health had brought to the meeting copies of questionnaires currently available. These were examined by the council members, but none seemed to be entirely suitable for use in the contemplated survey. Each member agreed to do some "homework" on them before the next meeting.

In addition to the need to devise a suitable survey form, two other important questions came up at this meeting. Was this voluntary group, the health council, duplicating activities of the officially appointed Union Health Department Committee? Would a survey such as the one they were planning be useful to this committee? It was decided to invite the members of this committee to the next meeting of the council before any more plans were made for the survey.

The Survey

The third meeting of the Auburn Health Council in March was attended by two members of the newly appointed Union Health Department Committee. They gave wholehearted approval to the council's plan to conduct a door-to-door survey. They spoke for their entire committee of five. The findings of this study, they said, would give them a very real basis for recommendations to the town regarding the Union Health Department Law and Auburn's public health services.

Considerable education of the health council members took place in the process of selecting survey questions in the light of their application to Auburn. Further value was derived from the necessity of adding questions on civil defense preparedness, tying in good basic health services with preparedness for disaster. The final questionnaire, a modification of the Clinton County, Ohio, survey form, was checked by the director of the chronic disease division of the Massachusetts Department of Public Health, who had agreed to have the coding and necessary tabulations done.

At this meeting the need for a permanent chairman of the council to assume responsibility for the survey became urgent. The chairman was unanimously agreed upon, and preparation for the survey proceeded rapidly.

Many individuals responded to the stimulation of participating in a worthwhile community venture. One of the health council members offered to supply the paper for the questionnaires and to have them printed at his expense. Both council members and other per-

sons offered their services for the interviewing. Even the school children assisted. Council members had decided that cooperation of the persons interviewed could be stimulated by use of a survey symbol, and the letter "H" for "health" was selected. The children cut out small H's from blue paper and tied them up in bundles of 15 for the interviewers' kits. The enumerator left one of these symbols at the home of each family when the interview had been completed. The H was placed in the window as evidence of the family's cooperation in the health survey, and it became a proud symbol of participation.

The map drawn up by the Red Cross for their annual fund drives was used in the allocation of the town into 18 districts. Survey captains were appointed, and each captain arranged to recruit volunteers to do the interviewing. The aim of the survey was to interview every family in town, and in such a small town it was possible to do this.

Training the Interviewers

Two training sessions were planned for the interviewers, with a pretest period between sessions, but delay in allocation of districts and in recruitment of volunteers made it necessary to cancel the second session. Health council members thought that all interviews should be completed by the end of May, before graduation and vacation plans became uppermost in the minds of the mothers in town and also would keep the interviewers busy in their own homes.

Over 200 women volunteers attended the single training session held in May, one week before the survey was scheduled to begin. The chairman of the health council gave an inspiring talk to the group, summarizing the Union Health Department Law, and explaining the objectives of the survey. A biometrician from the Massachusetts Department of Public Health explained the questions and the techniques of interviewing. Kits containing questionnaires, printed instructions, letter of introduction, and so on, were distributed to the interviewers. The questionnaire was discussed question by question, and each interviewer filled out a survey form with assistance from a group of resource people.

Policies regarding re-calls, dates of survey, publicity, announcement of results, and so on, were clarified. To tie in this inventory of health status with an immediate on-going community health program, it was decided to obtain information on anticipated response to the Worcester chest X-ray program, in which Auburn planned to participate in the summer months. This program was sponsored by the Worcester Chest X-ray Survey Committee consisting of representatives of the Worcester Medical Society, the Tuberculosis Association, boards of health, and other community groups with the cooperation of the Public Health Service.

The health officer from the Worcester district office of the Massachusetts Department of Public Health spoke briefly about the value of a chest X-ray, the plans for the summer months, and the need for citizen cooperation. The interviewers were instructed to ask at every home how many planned to have an X-ray and whether or not transportation would be needed.

The permanent chairman of the health council, the former temporary chairman, and the health educator from the Massachusetts Department of Public Health, Worcester office, were available locally throughout the 2 weeks of the survey to assist the interviewers if problems or questions arose. The house-to-house canvass proceeded on schedule for 2 weeks. Little resistance from householders was encountered, contrary to the expectation of some of the interviewers.

Results

The enumerators interviewed 2,392 families representing 8,448 persons out of a total population of 8,838, a coverage of 96 percent. There were 129 families reported not contacted. The Massachusetts Department of Public Health tabulated the results and submitted them to the members of the health council, with a series of suggested recommendations. The district health officer from Worcester discussed with council members the findings and recommendations and ways in which the recommendations could be adapted to fit the needs and resources in Auburn.

The findings showed that the number of in-

fants and children who had been immunized was not nearly as large as had been expected. Seven cases of undulant fever in a nonrural town seemed high. It was also surprising to townspeople that one family in four reported a chronic disease. All of these results were written up in the local paper. The health council based its report on the tabulations and suggested recommendations of the Massachusetts Department of Public Health, but addressed recommendations specifically to the official health agency, the water commissioners, and the Moderator's Committee, as well as to the council itself.

The questionnaires were surprisingly well filled out, but it is difficult to know just how accurately the answers represent the real reactions of those interviewed. Closer supervision of the actual surveying would have been desirable. The large number of interviewers introduced the chance for considerable inaccuracy. There is no doubt that it would have been more scientific to have the interviews conducted by a few well-trained enumerators.

The survey conducted by the Auburn Health Council was an educational experience for the persons interviewed, for the school children who cut out the blue H's, for the members of the health council, and especially for the interviewers. Concrete evidence that the health survey had resulted in increased awareness of health services on the part of the townspeople was the fact that, of the 10 towns participating in the Worcester chest X-ray program in the summer months following the survey, the town of Auburn had the highest percentage of persons X-rayed (79.5 percent of the eligible population). Newspaper publicity and printed signs announcing dates and location of X-ray units were the only other means used to urge people to participate in the X-ray program.

There was other tangible evidence that the objective of a new local awareness of public health needs and a willingness to take action to meet these needs had been achieved. In March of the following year, the town of Auburn voted to employ an additional full-time nurse. The tremendous increase in population had made the services of an additional nurse necessary, but before the survey it seemed unlikely that the town would be willing to assume the extra expense at a time when the cost of the school building program was very hard on the taxpayers. A series of well-child conferences, at which immunizations will be given, is planned for the fall.

These were some of the immediate objectives of the health council which were accepted and supported by a health conscious population. Other long-range objectives include passage of a local pasteurization regulation, a chronic disease survey, a spot sanitary survey of private water supplies and sewage disposal units, extension of the public water supplies to as many families as possible, and sponsorship of an educational program on the importance of early immunization and prenatal care.

The health council does not consider its role at an end since conducting the health survey. The council has accomplished much already. Auburn residents are interested in the survey findings, because many of them assisted in the interviewing and because information about them and their families is included in the data. They are impressed also by the fact that the entire survey was conducted at no expense to the town.

There are undoubtedly many examples of active steps toward better community public health which it is not possible to measure. Who can say how many mothers brought their babies to the doctor for immunizations, or for a physical checkup because they were reminded of their responsibility for such action by answering the questions on the survey? These are good results which cannot be measured, but they have a snowballing effect. They represent a community in action.

PHR

Public Health Contrasts in Hawaii, 1850–1953

By RICHARD K. C. LEE, M.D., Dr.P.H.

HAWAII is often described as the paradise of the Pacific. It is a healthy paradise as well—in climate and culture. Hawaii's communicable disease rates are the lowest in the world. As examples, there has not been a single case of smallpox contracted locally since 1913; not a single death from diphtheria since 1946, from scarlet fever since 1942, nor from typhoid fever since 1947, and not a single case of typhoid fever since 1949.

Hawaii's infant mortality rate for fiscal year 1953 was 21 per 1,000 live births; the maternal mortality rate was 3.1 per 10,000; and the tuberculosis mortality rate was 10.88 per 100,000. The reduction in Hawaii's tuberculosis mortality, as shown in figure 1, exemplifies the progress made in the control of this important health problem. Decline in mortality from diphtheria, tetanus, typhoid and paratyphoid fever, and pertussis is graphically shown in the four charts in figure 2. Hawaii has no rabies and no anopheles mosquitoes.

Dr. Lee, president and also chief executive officer, Hawaii Board of Health, was formerly director of public health for the Territory, from 1943 to May of 1953, and also deputy territorial commissioner of public health for the islands, from 1936 to 1943. A graduate of Tulane Medical School, where he was an instructor in gross anatomy from 1933–35, Dr. Lee received his doctorate in public health at Yale in 1938. He has lectured in public health administration and preventive medicine at the University of Hawaii since 1937.

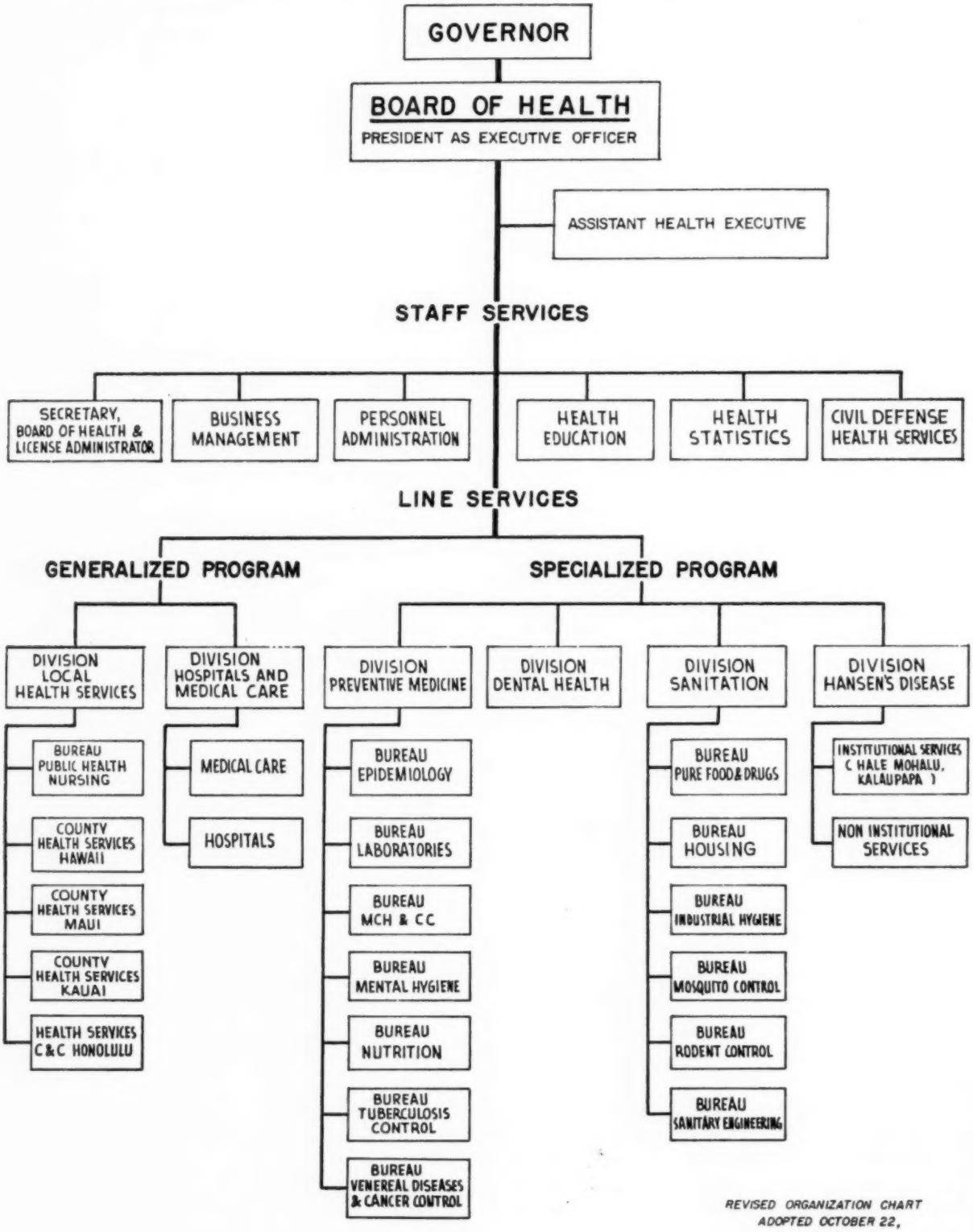
These facts are only a part of the public health picture in Hawaii in 1953. More than a hundred years ago, public health in Hawaii was a story of an insular community inhabited by Polynesian people who came from the South Pacific. They had lived in undisturbed isolation and were well adapted to the diseases which they brought with them. These native people multiplied so that when Captain James Cook discovered the Sandwich Islands in 1778, he estimated a population of 300,000 Hawaiians. But by 1850 the population had dropped to 75,000.

During the 100 years following Cook's discovery, Hawaii became the port of call for the whalers, the traders in sandalwood, furs, silks, and for all kinds of shipping, and the native people were exposed to new people and new diseases. Epidemics of communicable diseases such as smallpox, cholera, influenza, measles, venereal diseases, leprosy, and plague decimated the native population. Even such diseases as mumps and whooping cough killed both young and old. The epidemic of smallpox in 1853 was so severe that of a population of 19,126 persons on the Island of Oahu, 9,082 cases and 5,748 deaths were reported.

A Century of Progress

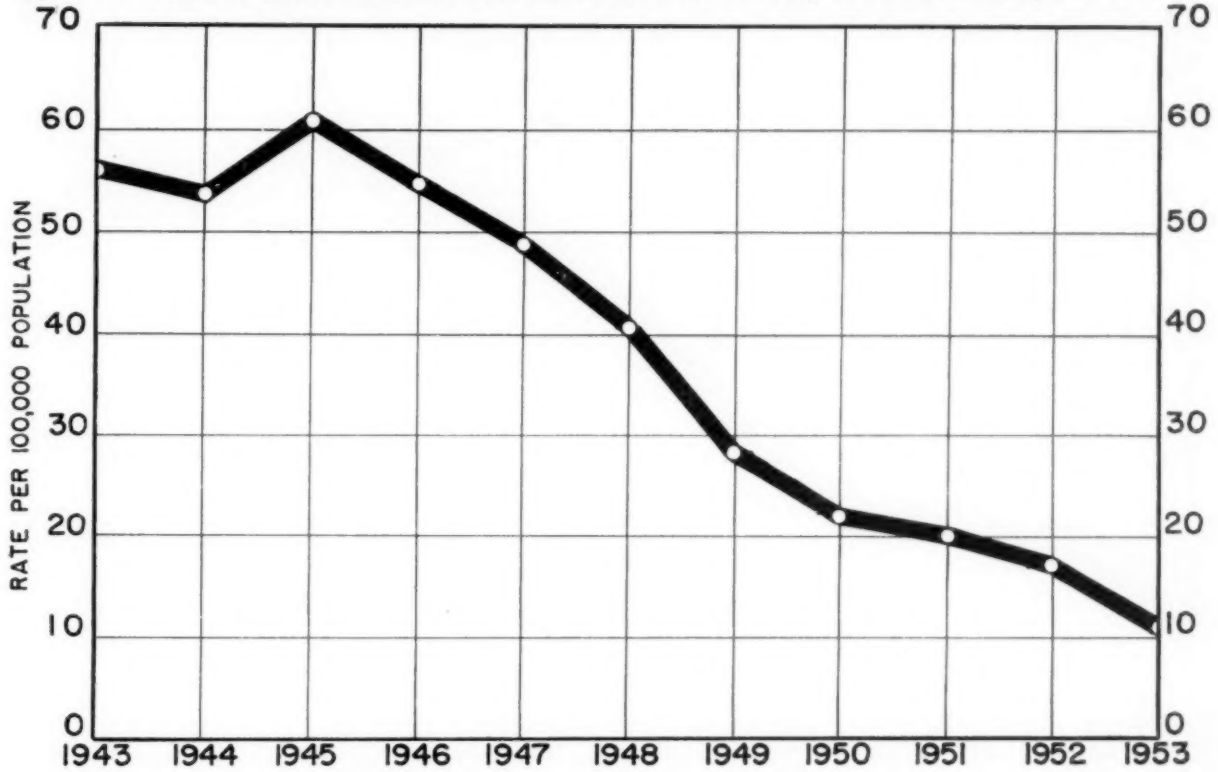
A century of public health progress since 1850 reveals a story of continued epidemics of diseases with more positive public health measures being undertaken, especially during the past half century. In that year King Kamehameha III and his privy council established

1953 organization chart of Territory of Hawaii Department of Health



REVISED ORGANIZATION CHART ADOPTED OCTOBER 22, 1953

Figure 1. Death rates from all forms of tuberculosis in the Territory of Hawaii, fiscal years 1943–53.



the first board of health in the Kingdom of Hawaii in order "to provide for the preservation and cure of contagious, epidemic or other diseases" and to enforce sanitary measures (*1*).

In 1850, maintaining potable water supplies was a sanitation problem because water used was all surface water. Today, Honolulu and the Territory have an excellent water service through actions of independent boards of water supply.

In 1854, vaccination of the population was made mandatory by the legislature. This requirement is still in effect today and is applicable not only to the local population but also to island visitors.

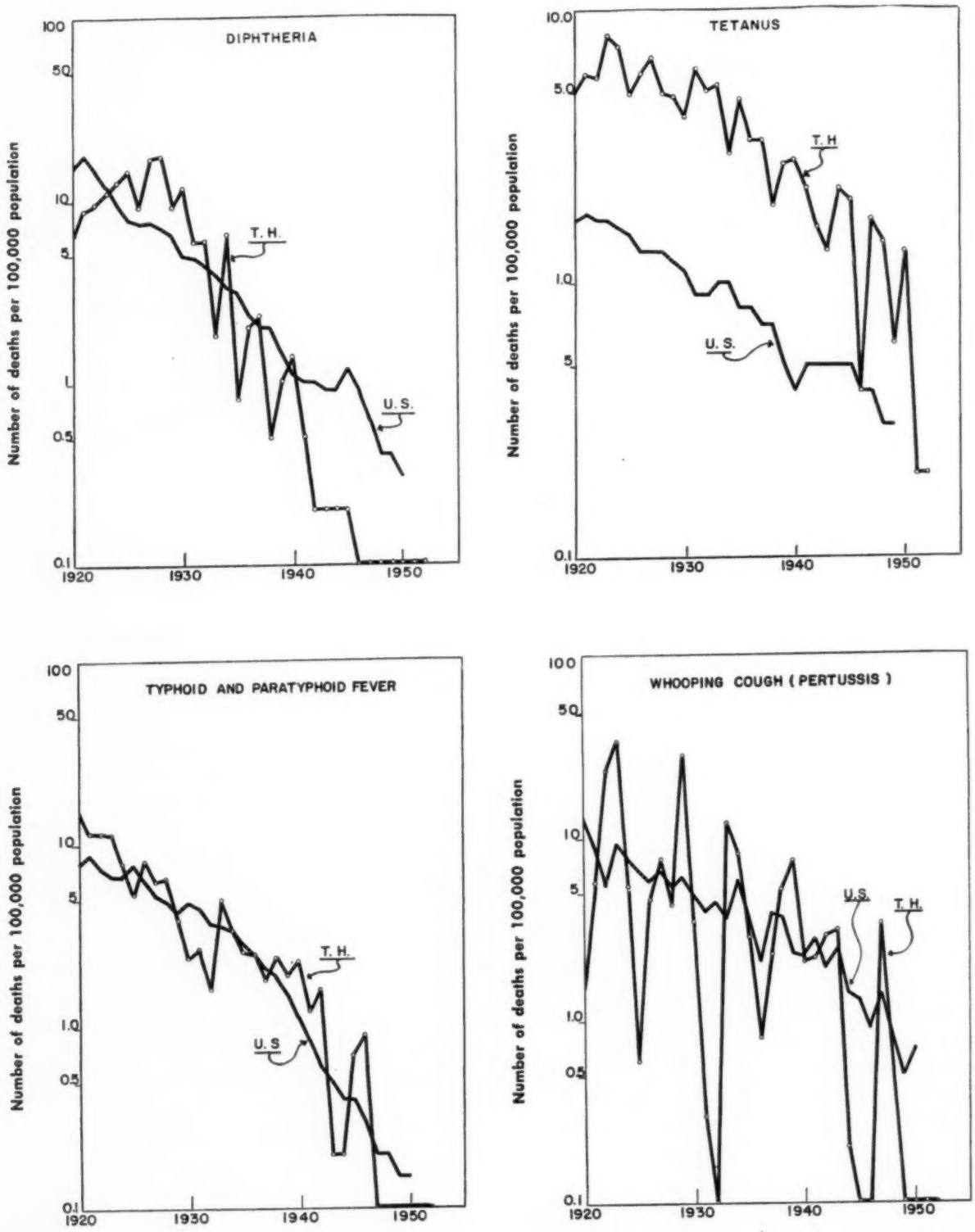
In 1865, Kalaupapa Settlement for leprosy patients was established. Today, Hawaii is making plans and looking forward to the reduction of this disease to a level where the care of patients will be in isolation units of general hospitals or in tuberculosis hospitals.

In 1868, "traveling" government physicians were employed on a part-time basis to care for the indigent and medically indigent. Today, this same system of traveling government physicians is used in 40 rural districts to provide health and medical services in every area of the Territory.

In 1899, bubonic plague made its appearance in all the major ports of the Territory. Today, with assistance from the Public Health Service of the United States, plague and murine typhus fever have been controlled through vigilant rodent control measures. Rodent plague continues to be endemic in small areas on the Islands of Maui and Hawaii in a native field rat. Hawaii has had an extensive program for a long time to bring this problem under control. Today, studies are being made to determine to what extent this program can be reduced and still offer adequate protection to the public health.

The first sanitarian was appointed in 1884. Today, the ratio of general sanitarians to population is 1 in 11,000 persons. The first public health nurse in the Territory was appointed in 1906. A generalized and cooperative program between private and official

Figure 2. Charts comparing death rates from diphtheria, tetanus, typhoid and paratyphoid fever, and pertussis in the Territory of Hawaii with the continental United States.



agencies was introduced in Honolulu in 1929. Today, the ratio of public health nurses to population is 1 in 6,500.

Public health measures over the century were devoted to problems of environmental sanitation as well as to the prevention and control of contagious diseases. Quarantine was a simple problem with seagoing ships. Today, travel of civilians and military personnel by large ships and airplanes requires constant vigilance and coordination by a well-trained and well-organized health department.

Health Department Organization

The Hawaii Board of Health consists today of 11 members who are appointed by the Governor and who represent all islands in the Territory. The president of the board is executive officer of the Territorial department of health. At least 2 of the 11 board members must be physicians and at least 1 must be a dentist. The attorney general of the Territory is an ex officio member. The board is required to meet at least once a month.

According to Territorial law, minimum qualifications for the president of the board require that he has been or is eligible to be certified by the American Board of Preventive Medicine and Public Health, Inc.; or that he is licensed to practice as a doctor of medicine or osteopathy in the Territory and has successfully completed at least 1 year of graduate study leading to a degree in public health, and has had during the 10 years just preceding his consideration for appointment at least 6 years of practical experience in public health work, including supervision or administration of such work in communities of not less than 50,000 population, or as a commissioned medical officer in the Public Health Service of the United States.

There are 640 employees in the health department, which is administratively divided into 7 divisions, as illustrated in the 1953 organization chart. A territorywide civil service system applies to all employees except the executive officer and his assistant. A Territorial retirement system and workmen's compensation coverage are provided for all.

The program of the department is territory-wide in scope. Appropriations serve all cities and counties. The county governments do not provide funds for health purposes since their work is limited to ambulance and first aid services and care for the convalescent and chronically ill. All employees and all programs are administered as one organization, with district units covering tricounty areas. The staff of the health department conducts the public health program for the City and County of Honolulu, where approximately 70 percent of the population resides, as well as serving as consultants on a territorywide basis. Of the department's annual budget of $4.5 million, $1 million is earmarked for the Hansen's disease program, $1.1 million for medical care of the indigent and medically indigent, and $500,000 are grant-in-aid Federal funds. Thus, about $2.5 million is devoted to other specific public health programs.

Some Other Achievements

Hansen's disease—then referred to as leprosy— was first reported in 1857. In 1865, the legislature passed legislation requiring compulsory segregation of patients with the disease. In 1866, the Kalaupapa Settlement on Molokai had 151 patients, and in 1890 the number of patients increased to 1,180. Today, there are about 251 active cases, 157 at Kalaupapa, and 94 at Hale Mohalu. The former is well known, and the latter can be reached by a 15-minute automobile ride from the center of Honolulu.

In Hawaii, Hansen's disease is treated as a communicable disease and patients are given complete care. Work and recreational programs, vocational training, adult and childhood education, rehabilitation services, corrective surgery, outpatient and other services are all part of the total program administered by the division of Hansen's disease. Public and professional education is an important part of the program.

Public medical care for the indigent and the medically indigent is administered by the division of hospitals and medical care. All public welfare clients receive hospital and medical care automatically. County social workers designate all medically indigent. The entire program is integrated with existing programs. The program is closely coordinated with local county

government services in hospital and medical care.

While many traditional public health activities are being continued, new activities have been stressed in mental health, nutrition, public health dentistry, chronic disease, and rehabilitation services. Medical and hospital resources are comparable to most States: The ratio of physicians to population is about 1 in 1,000 and dentists, 1 in 1,400. The ratio of general hospital beds is 4.5 per 1,000 population and of tuberculosis beds, 16 per annual death.

Hawaii's physicians and dentists are trained in mainland professional schools and obtain their specialized training and experience at accredited centers. The medical and dental societies are active in promoting good health standards in the Territory.

Grants have been made to the health department for demonstration programs, in cooperation with other agencies, for adequate care of premature infants, rheumatic fever, cerebral palsy, as well as fetal waste studies, X-ray surveys, and research in tuberculosis statistics. A committee is now studying the scope of nonfatal home accidents among children and adults. Special studies are also being made of mental hygiene services, chronic illness, rehabilitation, alcoholism, and dental health by special committees of health agencies in the community health council. Much still needs to be done in heart disease, cancer, diabetes, and dental health control.

The difficulty in recruiting trained and qualified personnel is constantly present. Qualified health workers are reluctant to leave the mainland and to bear the expense of bringing their families to Hawaii at salaries not higher—in fact, often lower—than those paid on the mainland. Only the lure of the beautiful islands and a wonderful climate have aided the recruitment program. The cost of travel prohibits staff members from attending courses or conferences that are so necessary to keep them informed and stimulated by the changing concepts and advances in public health. However, the department does encourage staff attendance at conferences when funds are available, and it helps obtain financial assistance for specialized training.

Progress Through Teamwork

The voluntary health agencies, the hospitals, the Oahu Health Council, the Honolulu Chamber of Commerce, and the Shippers' Wharf Committee are strong, effective organizations that complement the public agencies' efforts in public health programs (*2*). This teamwork has been one of the most important factors for Hawaii's effective, well-rounded, and comprehensive health program.

Hawaii's experiences in integrating a civilian health program under martial law during World War II did much to advance the control of disease. Mobilization of military personnel and military order made it possible for health workers to demonstrate what could be done in the prevention and control of disease when sufficient funds, personnel, and police power were applied together.

In international health, Hawaii will continue to offer field studies for workers from Asia and the Pacific area. We expect to maintain a high standard of health services for our people and for our visitors. We are making unique accomplishments in the control of communicable disease by compulsory immunization requirements; in Hansen's disease, tuberculosis, maternal and child health, and health services for civilian defense. We look forward to making progress in the chronic diseases, rehabilitation of the handicapped, medical care and hospitalization services, accident prevention, and mental health. We will seek continued support of voluntary health agencies in aiding health protection and promotion.

After making three surveys (*2–4*) of public health activities in Hawaii (in 1929, 1935, and 1950), Dr. Ira V. Hiscock includes this statement in his 1950 report:

"This study disclosed marked progress in the development of public health organization and services and dramatic results from these programs during the past 20 years. Hawaii is blessed with many natural resources which enrich the life of her people; but the modern comforts and scientific benefits so abundantly provided are the results of vision, energy, and careful planning of community leaders. The continued achievements in the promotion of

health and the reduction of preventable diseases indicate foresight, judgment, loyalty, and skill, with human benefits and significance comparable to the most advanced communities and States on the mainland. At the same time a generally apparent attitude of constructive self-criticism, coupled with the application of searching appraisal methods, gives promise of continuing advances in the health program of Hawaii in line with new scientific advances and tested procedures."

REFERENCES

(*1*) Ackland, R.: A century of public health in Hawaii. Honolulu, Office of Health Education, Department of Health, Territory of Hawaii, 1949.

(*2*) Hiscock, I. V.: Public health in Hawaii, 1950. Hawaii M. J. 10: 99–103 (1950).

(*3*) Hiscock, I. V.: A survey of health and welfare activities in Honolulu, Hawaii, including official and voluntary agencies, under the auspices of the United Welfare Fund, Department of Public Health, Yale School of Medicine, for the Committee on Administrative Practice, American Public Health Association. New Haven (?), 1929.

(*4*) Hiscock, I. V.: A survey of public health activities in Honolulu, Hawaii, including official and voluntary agencies, under the auspices of the Chamber of Commerce of Honolulu and a brief survey of the major health problems of the Territory, made with the aid of the Kauai, Maui, and Hilo Chambers of Commerce, with the cooperation of the Committee on Administrative Practice, American Public Health Association. New Haven (?), 1935.

Dedication of the Sanitary Engineering Center

The Robert A. Taft Sanitary Engineering Center of the Public Health Service in Cincinnati, Ohio, was formally opened with a 2-day program on April 8 and 9, 1954. The new $4 million building was dedicated on April 8 by Oveta Culp Hobby, Secretary of Health, Education, and Welfare. Guests at the dedication ceremony were introduced by Leonard A. Scheele, Surgeon General of the Public Health Service.

A scientific symposium on the control of the environment for the health of man was held on the second day of the program. Participating were Dr. Oram C. Woolpert, director of the Ohio State Research Foundation; Dr. Max Lauffer, head of the department of biophysics, University of Pittsburgh; Dr. Gordon M. Fair, professor of sanitary engineering, Harvard University; and Dr. Herman E. Hilleboe, commissioner of health of New York and president-elect of the American Public Health Association. Vernon G. MacKenzie, officer in charge of the Sanitary Engineering Center, was moderator of the symposium, and Mark D. Hollis, chief sanitary engineering officer of the Public Health Service, made the concluding remarks.

Dr. Abel Wolman, professor of sanitary engineering, Johns Hopkins University, spoke at the banquet held after the dedication ceremony. He discussed the significance of the new building and its research program, not only to the United States but to international efforts to raise health standards.

Pictures and a description of the new building and the program of the Center are scheduled for publication in the May issue of *Public Health Reports*.

Brucellosis Control

Brucellosis, both a human health and an agricultural economic problem, was the subject of a special session at Pennsylvania's Second Annual Health Conference held in 1953. The consensus of the five speakers at the session was that, with the epidemiological aspects and the preventive and control measures well established, brucellosis can be eradicated, if a strong policy is developed to apply the recommended procedures. Dr. Milo reported on Pennsylvania's progress in eliminating the disease in livestock, and Dr. Dean spoke on public health control activities. Dr. Dean's paper is presented in full; condensations of the other papers follow.

The Public Health Approach

By JOSEPH O. DEAN, M.D.

BRUCELLOSIS is the most prevalent disease of animals transmissible to man, and therefore public health officials are concerned with its control. On the public health side are such control measures as education, improved reporting of cases and diagnostic criteria, and the development of uniform laboratory aids essential to the diagnosis of human brucellosis.

But public health officials see the problem as one they can successfully cope with only as the veterinary profession and livestock sanitary officials succeed in eradicating the disease in domestic animals. Under the present limits of knowledge, the prevention of human brucellosis is dependent upon preventing exposure to infected animals and the infectious tissue or products of such animals. We have no other direct preventive measures, such as vaccination, for human brucellosis.

The human illness resulting from infection through the livestock reservoir, while important whether measured in suffering or direct economic loss, is not the whole consideration. Certainly, in the long run, food supply has to be considered as well.

Now of lesser concern, the problem of nutrition will grow as the population of the United States expands beyond the capacity of agriculture to supply the food it demands. Maximum

Dr. Dean was associate chief of the Bureau of State Services, Public Health Service, at the time of the Pennsylvania conference. He is now an assistant to the medical director of the Bureau of Indian Affairs, Department of the Interior.

production per animal unit becomes progressively more important to us and compels in effect a fusion of the agricultural economic and public health viewpoints. Dr. B. T. Simms of the United States Department of Agriculture has pointed out that history reveals no record of a well-fed nation which allowed animal diseases to go uncontrolled. In the past 40 years, our per capita meat consumption has dropped about 10 percent, and since 1930 the per capita milk consumption has also dropped.

In the United States, the policy of attempting to eradicate important livestock diseases has been adopted. The prevailing philosophy has been to live without rather than with many of the diseases which affect domestic animals and especially those transmissible to man.

National Plan

The problem of eradicating brucellosis is very difficult and has been hindered by a good deal of disagreement in the past. There is sufficient agreement now among livestock sanitary officials on the basic procedures necessary in an eradication program to command the support of public health workers. Effective support will require an acquaintance with the national plan of the United States Livestock Sanitary Association and with the recommendations of the National Research Council's Committee on Public Health Aspects of Brucellosis in its report on the control and eradication of brucellosis in animals.

The national plan and the committee's report make apparent the necessity for regulations that govern the movement of livestock across national, State, and farm boundaries so as to minimize the risk of introducing or extending infection. In our agricultural and livestock economy, the intermingling of animals from different herds is one of the most serious obstacles to the eradication of disease. With the steady growth of livestock traffic through trucking and other transport and through sales barns, the need for livestock regulation also grows.

There are a number of things public health personnel can and should do to aid in brucellosis eradication. We need to have at least a speaking acquaintance with the facts and procedures upon which present efforts are based if we are to support those more directly engaged in the work.

We can help foster a wider appreciation of the disadvantages, both economic and healthwise, of infection in farm and range animals. Certainly the occupational hazard of brucellosis needs highlighting. The dependence of the packing plant workers upon the stockman for protection and the responsibility of the stockmen to the packing plant workers are insufficiently understood. Public health agencies can intensify their educational and information efforts to improve the understanding of the public, particularly workers in slaughter houses, packing houses, and butcher shops, as to the nature of the disease and the feasibility of its control and the costs of living with brucellosis compared to banishing it.

As control progresses, closer liaison with veterinary and livestock sanitary officials takes on an added importance. Human cases will be traced to the common or individual source. That information placed in the hands of those engaged in the eradication of brucellosis in animals will serve as a check on where infection has been missed in the testing program. Likewise, by making available to public health officials information on the location of infected herds, veterinarians can assist the health department in tracing sources of human infection.

New Milk Ordinance

Milk ordinances have had an important influence upon the dairy industry. Certainly, public health policy has been a strong factor in motivating the production of milk from disease-free animals.

The fact that about 90 percent of the market milk in the United States is pasteurized undoubtedly is related to the fact that only about one-fourth of human brucellosis is traceable to consumption of milk or dairy products. The remainder is traceable largely to direct contact with infected animals or carcasses. Our goal, however, must be pasteurization of all market milk. This would further reduce the number of human cases. But more than pasteurization is required. Because mechanical and human failures can occasionally defeat the most con-

scientious sanitation program, milk from uninfected herds must be the aim.

Under the new 1953 milk ordinance and code, recommended by the Public Health Service, all milk producers in States and communities adopting the ordinance must be operating under plans A or B within 3 years of its adoption. Plan A specifies testing of infected herds, immediate slaughter of all adult reactors, thorough cleaning and disinfection of barns and buildings in which reactors have been kept, and retesting at intervals of at least 30 days until the disease is eradicated. Plan B requires testing of all adult animals, but permits temporary retention of reactors in the herd until they can be disposed of by slaughter without excessive financial loss to the owner. Calf vaccination is optional in both plans.

In either plan, all additions to the herd, except calves born into the herd or vaccinated, have to be free of brucellosis as determined by a negative test given not more than 30 days prior to such addition. Calf vaccination is permitted in herds required to be free of brucellosis if the calves have been vaccinated between 4 and 8 months of age with a vaccine approved by the United States Department of Agriculture and carry a blood agglutination titer no higher than incomplete in a 1:100 dilution, which subsequently stabilizes or drops below this level.

Ultimately, the standard ordinance will specify that all milk-producing herds be under plan A. Health officers wishing to assist the State and Federal livestock disease control officials in developing brucellosis-free certified herds and areas should file a request for cooperative testing with the State veterinarians. The provisions of the new ordinance and code are compatible with, and follow closely, the recommendations of the United States Livestock Sanitary Association and the program approved by the United States Department of Agriculture, and I am certain will in every sense aid the program.

The 1939 ordinance had no requirement for brucellosis control with respect to milk intended for pasteurization. It was a serious shortcoming. However, the adoption of the code by 1,565 municipalities and by 405 counties and its use in framing laws and regulations in 34 States give a fair insight into the effect we may expect the new ordinance to have on brucellosis eradication among dairy cattle.

As pointed out, control of human brucellosis is primarily achieved by informing the public and selected occupational groups about the nature of the disease, mode of transmission, and danger of infected milk and carcasses, and by attacking the animal reservoirs. The latter calls for discovery of infection among livestock by agglutination reaction and the elimination of reactors from herds by segregation or slaughter, vaccination of calves and pasteurization of milk.

Recognition and Diagnosis

However, much remains for public health officials to do about individuals who acquire the disease.

To begin with, we need much better recognition of the disease. Recognition is difficult because most human brucellosis appears as a sporadic disease and simulates many other illnesses in its symptomatology. Recognition has been confused by overemphasis of the chronic aspects of the disease and misplaced trust in the dermal sensitivity test. Only a small proportion of cases represent chronic brucellosis, lasting over a period of months and years. The dermal sensitivity test is generally regarded as being of no aid in the diagnosis of a suspected case and as having no place in clinical medicine.

A definite diagnosis can only be made with the aid of laboratory procedures, namely, cultural studies and the agglutination test. Cultural studies should be made on every patient suspected of having brucellosis. Increasing use is being made of sternal bone marrow when culture of venous blood has been unsuccessful.

With the increased tendency to use antibiotics for febrile conditions of unknown etiology, the agglutination test is being depended on more and more for the diagnosis of brucellosis.

The reliability of the test depends on the antigen used. There is a wide variability among antigens and test procedure in current use, with accompanying variability in the specificity and reliability of results.

The success of the program for the control

and eradication of brucellosis in domestic animals is due largely to the use of standardized antigen and a standardized test procedure. A number of public health laboratories have found the antigen prepared by the United States Department of Agriculture very satisfactory, and the extension of its use to all clinical and public health laboratories has recently been recommended by the Association of State and Territorial Health Officers.

It has been said the clinician should not depend on a so-called diagnostic titer. In general, but by no means surely, the higher the titer the more likely it represents infection. In experiments on human volunteers, individuals fed heat-killed *Brucella abortus* organisms in quantities that might be found in pasteurized milk from infected cows developed agglutinins against this organism in fairly high titer. In several instances, agglutination in a 1:640 dilution of the serum was obtained.

However, the great majority of culturally proved cases are associated with a titer of 1:100 and above. Often agglutinins may be demonstrated when the serum is diluted 10 to 20 thousand times. In groups repeatedly exposed to *Brucella*, such as farmers, meat packing plant employees, and veterinarians, even the higher titers lose diagnostic significance because many of these persons have titers of 1:320 or higher without being ill. Rise of agglutination titers in persons who have recently had a skin test likewise has little, if any, diagnostic significance. Apparently, for practical purposes, therapy with antibiotics does not interfere with the diagnostic value of the agglutination test.

Better recognition of cases, then, necessitates more rigid diagnostic criteria and reliance on laboratory procedure for confirmation of diagnosis, the preference being for isolation of the infecting organism. Use of a standard reliable antigen and test procedure subjected to periodic evaluation of results will substantially enhance the value of the agglutination test and the identification of cases. The skin test—dermal sensitivity test—should be abandoned.

Case Reporting

Finally, reporting of cases to the health departments is essential. Given accurate diagnosis and adequate recognition of cases by the clinician, the case still must be traced to its source and the source eliminated, if a complete job is to be done. This epidemiological tracking down of sources cannot be done feasibly in the absence of good reporting.

Over the last quarter century the number of cases of reported human brucellosis rose from less than 100 to more than 6,300 in 1947. Since 1947, there has been a steady decrease, with only 2,537 cases reported nationally in 1952. How much of this decline represents more accurate diagnosis or how much of it reflects an actual decrease in the incidence of human brucellosis, we do not know. We are confident, of course, on the basis of epidemiological studies made by various investigators that recognition and reporting of cases is very incomplete. At the same time, in known instances the reported cases in a State have dropped inside the areas or counties where brucellosis eradication work in animals was progressing, and concomitantly an actual increase occurred in the remainder of the State.

In the absence of other obvious, practical incentives, responsibility for eliminating brucellosis from animal herds rests for the time being almost entirely upon public health policy.

Human Brucellosis

PHR brief

Brucellosis is a disease of animals, mainly domestic animals, of worldwide distribution. Man acquires the disease usually by direct contact with infected animals, their excretions, secretions, or tissues, or by ingesting unpasteurized milk or other dairy products derived from infected animals. While *Brucella abortus* is found mainly

By Norman B. McCullough, M.D., chief, Laboratory of Clinical Investigation, National Microbiological Institute, National Institutes of Health, Public Health Service.

in cattle, *Brucella suis* in swine, and *Brucella melitensis* in goats and sheep, any of the three species may occur in any of these animals. In the United States, cattle and hogs are the chief reservoirs. Thus, most of our human infections are due to *Br. abortus* or *Br. suis*. In this country, *Br. melitensis* is present mostly in swine and constitutes an additional public health hazard. In public health importance, brucellosis now ranks as the leading disease of animals transmissible to man.

With the pasteurization of most of the commercially distributed milk, this avenue of transmission is becoming less important. In epidemiological studies conducted during the last few years, approximately 75 percent of the human cases have been shown to be due to direct contact with infected animals or their tissues. Brucellosis is an occupational disease, mainly affecting those groups intimately in contact with infected animals or their carcasses—the cattle and swine raiser, dairyman, packing plant worker, meat handler, and veterinarian.

Clinically, human brucellosis, also known as undulant fever or malta fever, can present a varied picture. The acute case is characterized by high fever, extreme weakness, and excessive sweating. The onset may be abrupt or gradual, and the disease may last for a few days or weeks, without subsequent recurrence, or there may be one or more recurrences after the initial episode. In other cases, the disease may last for months or years with low-grade fever and multiple symptoms such as weakness, lassitude, and generalized aching, with remission and recurrences. The organism may localize in any part of the body. The symptoms are then dependent on the site of localization. A great many cases are probably entirely subclinical and recognizable illness does not result.

With the advent of the antibiotics, treatment of human brucellosis is now available. The broad spectrum antibiotics by themselves suppress the disease, but the relapse rate is high. The most efficacious treatment makes use of a combination of drugs. Dihydrostreptomycin, aureomycin, and sulfadiazine (or triple sulfonamide) given concurrently is the therapy of choice. Treatment must be intensive and prolonged to reduce the risk of relapse. Bed rest and general therapy are important items in the treatment. Localized complications may require special therapy.

Pathology and Transmission

PHR brief

Brucella organisms may enter the body through the skin, the conjunctiva, and the digestive, genital, and respiratory tracts.

The digestive tract is believed the main portal of entry for cattle and swine. But for swine the genital tract is also important, because the boar is much more frequently infected than the bull, and discharges large numbers of *Brucella* with the semen during breeding.

In man, most infections are acquired through the skin from contact with infected fetuses, placentas, or other animal tissues. *Brucella* may enter through any wound or abrasion, but even the intact skin is no barrier against this organism.

Ticks, flies, bedbugs, and other ectoparasites, feeding on infected material, can spread the organisms through intestinal droplets deposited on the skin or conjunctiva. Dust particles, stirred up from infected litter, may be inhaled and lead to infection.

Establishment of *Brucella* in the tissues after it has penetrated one of the barriers depends on a number of factors: the pathogenicity of the three *Brucella* species; the number and virulence of the infecting organisms; natural or acquired resistance of the host; age of the host; and stage in the reproductive cycle of the host.

Some species, such as the rat, mouse, chicken, and hamster, are somewhat more resistant to *Brucella* infection than the cow, hog, guinea pig, rabbit, and man, and larger doses of *Brucella* are needed to establish infection in the former group.

By I. Live, V.M.D., Ph.D., professor of microbiology, School of Veterinary Medicine, University of Pennsylvania.

Young Are Resistant

The age of the individual seems to have a definite relationship to susceptibility to *Brucella* infection. Cattle are resistant up to breeding age. Under natural or artificial exposure such animals develop only a low agglutinin titer of short duration, and the infection is transient. According to various studies, children are more resistant to infection than adults. Swine of all ages are susceptible, but the effects of the disease are more pronounced in older animals than in the young. The increase in the susceptibility with sexual maturity may be due to the appearance of certain hormones at puberty, or it may be the result of the development of tissues which *Brucella* prefers for localization, such as the chorionic epithelium and the mammary gland.

Pregnancy is known to enhance the establishment of the infection. Fully mature nonpregnant cattle are generally less susceptible to permanent infection than pregnant cows. This fact and the knowledge that *Brucella* tends to localize in the pregnant uterus and through it infect the fetus lead to the conclusion that *Brucella* has predilection for embryonal tissues. The lymph nodes, joints, spleen, liver, and bone marrow also are frequently involved.

Histopathological studies have revealed that the organisms invade the tissue cells, thus leading an intracellular existence similar to that of filterable viruses. This is important in the treatment of brucellosis. The antibiotics and sulfonamides used cannot be expected to reach the organisms within the cells, and they affect mainly the *Brucella* in the body fluids. Thus, the intracellular organisms may survive a course of treatment, and eventually cause the recurrence of clinical symptoms. The intracellular parasitism may also be responsible for the chronic conditions, because the *Brucella* within the tissue cells is protected from the bactericidal action of the serum.

Avenues of Elimination

The most common and dangerous avenue of elimination of infected organisms is from the infected uterus at the time of abortion or parturition. *Brucella* may continue to be eliminated from the uterus exudate for several weeks or occasionally even longer.

In the pregnant animal, the infecting organisms invariably invade the cells of the maternal placenta (chorion). There is destruction of cells, accumulation of exudate between the maternal and fetal placenta, and adhesion between the two layers. If a large area of the chorionic epithelium is involved, the fetal circulation may be sufficiently interfered with to cause asphyxia and death of the fetus, and the animal aborts.

If the animal is infected late in pregnancy or has developed some resistance, the damage produced may not be severe enough to cause abortion. But the bacteria will be there and will be eliminated at parturition. In cattle, abortion usually occurs during the second half of pregnancy, but in swine abortion may occur at any stage of gestation, sometimes so early that it may pass unnoticed. The adhesions between the fetal and maternal placenta may result in a retained placenta which often has to be removed manually.

Another important mode of elimination of *Brucella* is through milk from an infected udder. It is estimated that the mammary gland is infected in the majority of cases of brucellosis in cows. Nursing calves which drink milk containing *Brucella* do not become permanently infected because young bovines are resistant. However, the organisms may pass intact through the digestive tract of the calves, thus spreading the infection to susceptible animals which may come in contact with the contaminated fecal matter.

Viability

After elimination from the animal body, the organisms remain alive for varying periods of time, depending upon the environment and the conditions under which they are kept. *Brucella* is readily destroyed by exposure to heat which is lethal to other nonspore-forming bacteria. In suspension, all three species of *Brucella* are killed in 20 minutes at 60° C. Direct sunlight is lethal to the organisms within several hours. On the other hand, *Brucella* will survive for a long time when exposed to cold temperatures. *Brucella suis* has been recovered from an infected spleen kept at −10° F. for 30 days. *Brucella abortus* was alive in in-

fected exudate from the bovine uterus 7 months after being stored in an ice chest. *Br. abortus* remained viable for 30 days in ice cream stored at 32° F. and in butter kept at 46.5° F., for 142 days.

Brucella appears sensitive to the action of an acid environment. It dies rather rapidly in milk kept at room temperature and survives longer at refrigerator temperatures.

In cheddar cheese produced from infected milk and permitted to ripen for 1 year no *Brucella* could be recovered.

The Pennsylvania Program

PHR brief

The bureau of animal industry of the Pennsylvania Department of Agriculture, in cooperation with the United States Department of Agriculture, has been waging a campaign against brucellosis in livestock in Pennsylvania since August 1934.

Federal indemnity covering reactors found as a result of the agglutination test for brucellosis was available to herd owners in Pennsylvania August 1, 1934, and State funds covering indemnities were available May 1, 1937. Since that time herd owners in this State have received more than $13 million from the State and Federal governments. Results attained by this expenditure of public funds and the efforts of the veterinary profession and other cooperating agencies in combating this disease follow.

County and Herd Tests

As of July 1, 1953, 25 of the 67 counties in Pennsylvania were certified as free of brucellosis. Areas are certified when the incidence of the disease has been reduced to 1 percent or less and the percentage of infected herds does not exceed 5 percent. The last brucellosis test of the cattle population in these 25 counties showed that the percentage of infection had been reduced to 0.7 percent. In addition, 8 counties have been completely tested and every indication points to the fact that the next countywide test will certify these 8 counties. Twenty-three other counties have been partially tested.

On July 1, 1953, Pennsylvania had 75,404 herds, comprising 827,085 cattle, under supervision for brucellosis. This is approximately 50 percent of the total number of herds and cattle in the State.

To attain these results it was necessary to test 610,490 herds, comprising 6,216,590 cattle. This includes initial and retests of herds since August 1, 1934.

We also have 355 goat herds, comprising 2,904 goats, under supervision. Pennsylvania does not have a program at this time covering the testing of swine herds for brucellosis. However, owners may receive this service from their local veterinarian.

Calf Vaccination

Calf vaccination is considered a valuable adjunct to the brucellosis program, and, since January 1, 1950, the State has supplied *Brucella abortus* vaccine to practicing veterinarians for vaccinating calves, and it has also remunerated them for vaccination services.

During 1952, 136,000 calves were vaccinated in connection with the brucellosis program, and during 1953 a total of 700,000 calves were vaccinated.

Calves vaccinated between the ages of 6 and 8 months are subject to State and Federal indemnity if they give a positive reaction to the test when they are more than 30 months of age. Calves between 8 and 10 months of age may be vaccinated at the owner's request. However, they are not subject to State or Federal indemnity if they react positively after reaching the age of 30 months. If a calf over 30 months of age gives a suspicious titer to the test, the owner may present it for a retest. If the retest does not exceed a titer of over 1 : 100, or declines, the owner will not lose the status of a certified herd at the time of the last herd test.

By H. A. Milo, V.M.D., director, bureau of animal industry of the Pennsylvania Department of Agriculture.

Calf vaccination has been most successful in that it gives the herd owner an opportunity of replacing older animals with heifers that have a certain amount of immunity when exposed to infection.

Funds Reduced

For the first time in the history of the brucellosis control and eradication program, Pennsylvania is in a position to keep up with the present schedule and to test areas that may qualify in the future. The expansion of the program will depend entirely upon State and Federal funds available for indemnity purposes.

Federal funds for indemnity purposes covering brucellosis reactors have been reduced considerably, and it has not been determined what portion of these funds will be allocated to Pennsylvania and what restrictions will be necessary in order to make these funds reach as far as possible and to use them where they will accomplish the greatest amount of good.

Veterinarian's Viewpoint

PHR brief

Veterinarians have found that regular testing of herds and elimination of infected animals, calf vaccination, and proper sanitation are all required to eradicate brucellosis. No one method suffices.

The test and slaughter method has been effective in reducing the incidence of brucellosis on an area basis in Pennsylvania when economic conditions have been favorable for the herd owners. In 1934, when brucellosis control was instituted on a national basis as part of a cattle reduction program, Federal and State funds became available for the payment of indemnities, for veterinary services, and for laboratory procedures.

Farmers cooperating received enough from indemnities and from slaughter salvage to replace condemned animals. Many herds were replaced several times during this period. But when prices for cattle and milk products became high commercial dairymen and beef producers were no longer keenly interested in disposing of infected animals. Problems began to arise for regulatory officials and the veterinarians conducting the test and slaughter program. Some owners refused to have their animals tested. Although brucellosis was being successfully controlled in thousands of herds and in many areas of Pennsylvania, it became obvious that it was not economically feasible nor practical to continue on a test and slaughter basis without some adjunct.

By C. J. Hollister, D.V.M., general veterinary practitioner, Montrose, Pa.

Vaccination Results

In 1941, *Brucella abortus* vaccine, strain 19, came into general use. We had, in addition to other methods of control, calf vaccination and adult vaccination with retention of positive animals.

Immunity conferred by *Brucella abortus* vaccine is not absolute nor permanent and can be broken down by continued exposure. But vaccine alone will go a long way toward preventing abortions and resultant sterility. When this clinical evidence of brucellosis has been controlled, it is difficult to convince the owners to test and eliminate the residual infection, which is a potential danger to both animals and man.

In untested areas where vaccine has been used to check the symptomatic course of the disease, owners are pleased with the results. When abortions stop the owner feels that brucellosis has been controlled and nothing further needs to be done. This, of course, is not true since after an abortion storm, the disease becomes chronic, a potential cause of fresh outbreaks.

The use of vaccine in calves in clean herds is not without its problems. Many veterinarians have seen calfhood-vaccinated purebred cattle penalized because they have not returned to a negative status by the time they are 30 months of age. Veterinarians sometimes won-

der if they should continue "selling" calf vaccination in these herds, when they see a branded reacting animal bring 4 cents a pound less than an actinomycotic lumpy-jawed animal that was not branded.

There is another problem that needs appraisal. Since *Brucella suis*, the main cause of brucellosis in swine, and *Brucella melitensis*, the cause of brucellosis in goats, are pathogenic to cattle, the question is whether brucellosis can be eradicated in cattle without also eliminating the disease from these species. Indeed the complexity of the whole brucellosis problem is difficult for the average herd owner to understand.

Accelerated Program

Pennsylvania now has an accelerated program as a direct result of the determination of public health officials to eliminate brucellosis from cattle herds and thereby eliminate one of the causes of brucellosis in man.

A statewide brucellosis committee was formed in 1949 to facilitate eradication of the disease within Pennsylvania and to establish it as a "modified accredited brucellosis-free State." Its origin stemmed from a joint meeting of a group of agricultural representatives with representatives of the United States Department of Agriculture, the Pennsylvania Department of Agriculture, the Pennsylvania State College, and the Pennsylvania State Veterinary Medical Association.

The committee is composed of one delegate from each county brucellosis committee and one representative from the Pennsylvania State Veterinary Medical Association. The State committee meets once yearly to review the progress of the program and pass on resolutions presented from district meetings. An executive committee, appointed by the State committee, meets with the Pennsylvania Department of Agriculture to make recommendations for a better program.

Some large milk markets affecting Pennsylvania dairymen have already passed ordinances that require all dairymen shipping milk to these markets to test their herds for brucellosis. Many more markets are expected to follow suit.

. . . not in any newspapers . . .

"It is heartening to know that all over the world there are very large numbers of people quietly working away at their jobs, getting their feet wet and their hands dirty, coping with heat and cold and wet and dryness and fatigue and frustration, and sometimes discouragement, but they do carry on. Nobody knows about them; their names are not in any newspapers; they are hardly ever pictured by anyone. But these are the people who are making the real contacts between nations and between races and groups, and these are the people who need your support."

—Dr. Brock Chisholm, former Director-General,
World Health Organization

Reported Cases of Venereal Disease In the United States Fiscal 1952 and 1953

THE DOWNWARD TREND in both syphilis and gonorrhea case rates, begun following World War II, continued during the fiscal year 1953. However, smaller decreases in annual case rates from 1952 to 1953 as compared to previous years indicate a current tendency for these rates to level off. If this tendency continues, it will not be long before the rates cease to decline. Trends of reported case rates of total syphilis, all early syphilis (primary, secondary, and early latent), and gonorrhea for the past 10 years are shown in the chart.

Annual summaries of reported cases of venereal disease, on a fiscal year basis, by disease and by stage, for each State and the continental United States, are shown in table 1 for the fiscal year 1952 and in table 2 for the fiscal year 1953. These tables include cases reported for the first time by the States to the Public Health Service. Cases among military personnel have been excluded when this information was known.

Syphilis

There were 156,099 cases of syphilis reported in the fiscal year 1953 (table 2). Of these, 9,551 were primary or secondary cases; 32,287, early latent (latent syphilis of 4 years' duration or less); and 100,195, late and late latent. Congenital syphilis cases, regardless of age at diagnosis, totaled 8,021. For approximately 4 percent of the cases reported, the stage of syphilis was not indicated. These cases are included in the total syphilis reported, but are not shown separately. In the fiscal year 1953, the reported syphilis case rate was 100.8 per 100,000 population. Although this represents a decrease of 9.0 percent from the 1952 rate of 110.8, the decrease is much smaller than in the several previous years.

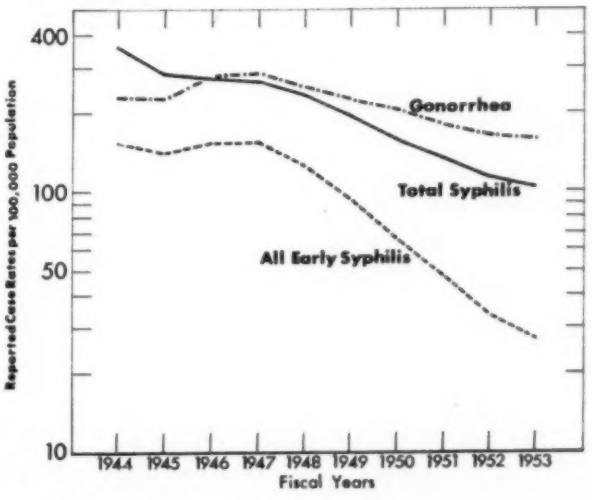
The reported case rate for all early syphilis was 27.0 per 100,000 population in the fiscal year 1953 and 33.1 in 1952. Here also the decrease is less than in previous years. In the fiscal years 1948 to 1952, the annual decrease from year to year remained fairly steady at approximately 30 percent, whereas the decrease from 1952 to 1953 was only 18 percent. Since the trend in the rate of early syphilis is probably indicative of the trend of incidence, the rate of decline in the incidence of all syphilis was apparently less in fiscal year 1953 than in previous years.

Gonorrhea and Other Venereal Diseases

Reported case rates for gonorrhea have declined at a much slower rate than the rates for syphilis. In the fiscal year 1953, a total of 243,857 gonorrhea cases was reported. The case rate was 157.4, a decrease of only 2 percent from the 1952 rate of 161.1 per 100,000 population.

There were 5,378 cases of the other venereal diseases reported: chancroid, 3,490; granuloma inguinale, 785; and lymphogranuloma venereum, 1,103.

Trend in reported case rates of total syphilis, all early syphilis, and gonorrhea, continental United States, 1944–53 (known military cases excluded).



Prepared by the Division of Venereal Disease, Bureau of State Services, Public Health Service.

Table 1. Cases of venereal diseases reported to the Public Health Service by State health departments, fiscal year 1952

[Known military cases excluded]

State	Syphilis						Gonorrhea	Other venereal diseases
	Total syphilis [1]		Primary and secondary	Early latent	Late and late latent	Congenital		
	Number	Rate per 100,000 population						
Alabama	3,459	115.3	372	1,032	615	160	3,391	216
Arizona	1,974	249.9	217	749	885	123	1,480	28
Arkansas	3,196	168.8	170	771	2,037	217	1,924	84
California	8,030	75.0	601	1,434	5,623	307	16,372	448
Colorado	650	48.5	97	133	389	31	985	6
Connecticut	903	44.7	51	198	541	42	792	9
Delaware	426	130.7	40	137	145	20	300	2
District of Columbia	3,340	433.2	56	759	2,448	75	11,680	413
Florida	9,402	325.9	801	3,277	4,921	403	12,311	754
Georgia	4,426	129.9	743	1,218	1,814	591	12,537	828
Idaho	262	44.6	25	43	181	9	314	13
Illinois	8,726	100.0	815	1,947	5,613	351	19,127	212
Indiana	2,977	74.4	220	709	1,825	223	2,135	24
Iowa	1,509	57.7	137	313	926	84	577	1
Kansas	2,397	124.7	168	464	1,640	125	1,169	20
Kentucky	2,219	77.9	220	431	1,419	139	3,293	48
Louisiana	7,046	258.9	339	1,508	4,021	675	7,520	383
Maine	221	25.0	30	31	139	21	189	1
Maryland	3,439	144.9	243	741	2,134	169	7,419	301
Massachusetts	2,354	50.4	253	290	1,628	183	1,264	13
Michigan	5,843	89.9	312	1,195	2,834	219	7,944	145
Minnesota	562	18.9	59	66	415	18	549	1
Mississippi	4,817	222.7	367	947	2,857	646	9,499	219
Missouri	4,884	122.0	291	1,150	3,216	220	4,343	77
Montana	185	31.7	21	45	96	6	123	----
Nebraska	643	48.1	32	128	345	38	559	8
Nevada	165	99.4	16	21	117	11	190	6
New Hampshire	142	26.8	12	10	102	18	49	----
New Jersey	3,661	74.7	212	997	2,305	121	3,980	60
New Mexico	631	92.1	58	235	274	60	516	7
New York	27,374	183.5	908	3,407	22,238	709	15,404	379
North Carolina	3,873	95.7	500	1,548	1,368	457	13,804	376
North Dakota	126	20.9	20	29	61	10	153	2
Ohio	10,001	124.7	542	2,721	5,437	455	8,171	136
Oklahoma	2,947	132.1	174	517	2,046	208	4,621	25
Oregon	547	35.4	58	105	362	22	640	19
Pennsylvania	5,242	50.0	272	1,793	2,874	211	8,894	95
Rhode Island	476	61.9	24	40	319	28	158	1
South Carolina	5,857	283.5	379	1,781	3,401	296	6,170	119
South Dakota	168	26.3	12	71	71	14	300	----
Tennessee	5,080	154.5	391	1,146	3,224	277	18,784	148
Texas	7,283	93.7	603	1,690	2,390	725	21,283	211
Utah	170	24.2	21	17	78	10	125	1
Vermont	142	38.3	20	10	87	21	173	----
Virginia	6,032	187.2	669	1,616	3,325	257	9,234	189
Washington	536	22.9	67	73	363	24	1,811	91
West Virginia	2,583	130.0	183	552	1,704	144	2,388	10
Wisconsin	1,611	46.7	153	239	932	63	886	12
Wyoming	197	69.1	17	31	135	4	103	----
Continental United States	168,734	110.8	11,991	38,365	101,920	9,240	245,633	6,141

[1] Including stage not stated.

Table 2. Cases of venereal diseases reported to the Public Health Service by State health departments, fiscal year 1953

[Known military cases excluded]

State	Syphilis						Gonorrhea	Other venereal diseases
	Total syphilis [1]		Primary and secondary	Early latent	Late and late latent	Congenital		
	Number	Rate per 100,000 population						
Alabama	2,160	70.8	205	630	307	105	3,685	159
Arizona	2,311	271.9	195	789	1,227	96	1,380	18
Arkansas	2,629	144.1	117	548	1,762	202	1,861	121
California	6,897	62.2	510	1,330	4,692	284	16,335	265
Colorado	376	27.1	42	87	226	21	986	27
Connecticut	956	45.5	44	147	667	37	807	12
Delaware	419	122.5	27	120	142	12	211	2
District of Columbia	3,693	468.1	69	823	2,720	81	12,312	631
Florida	9,363	310.3	713	3,312	4,982	356	11,170	657
Georgia	2,929	85.5	496	931	1,143	300	13,717	550
Idaho	246	42.1	7	41	194	3	304	9
Illinois	6,428	72.2	618	1,343	4,177	290	21,117	172
Indiana	2,507	60.9	148	585	1,615	159	2,051	25
Iowa	1,365	52.4	80	187	999	80	717	6
Kansas	2,081	107.4	137	438	1,416	90	1,292	19
Kentucky	1,688	58.8	156	314	1,110	102	3,312	64
Louisiana	8,439	311.6	257	1,279	5,776	597	8,197	397
Maine	151	17.1	20	13	105	13	142	2
Maryland	2,823	115.5	190	473	1,852	140	8,039	93
Massachusetts	1,505	32.1	165	127	1,101	111	1,512	14
Michigan	7,501	112.5	239	1,392	3,905	239	7,899	63
Minnesota	401	13.3	23	55	308	14	618	----
Mississippi	3,570	167.1	165	490	2,494	421	8,926	199
Missouri	3,702	93.9	163	725	2,629	161	4,281	52
Montana	125	21.1	19	25	47	8	187	----
Nebraska	593	44.1	27	88	339	30	514	2
Nevada	251	141.0	27	24	188	12	220	4
New Hampshire	131	24.8	4	12	102	12	48	----
New Jersey	3,925	78.1	176	1,068	2,522	138	5,084	117
New Mexico	556	78.1	31	160	310	54	714	13
New York	28,507	189.6	836	3,066	23,870	631	14,737	375
North Carolina	3,445	84.3	378	1,323	1,419	325	14,033	263
North Dakota	100	16.6	15	15	50	9	138	1
Ohio	9,384	113.7	442	2,228	5,991	435	7,944	168
Oklahoma	2,045	93.5	75	330	1,440	198	4,253	45
Oregon	586	36.7	40	100	423	23	578	7
Pennsylvania	4,388	41.7	238	1,444	2,505	164	8,557	53
Rhode Island	537	68.7	43	39	347	21	139	----
South Carolina	6,315	297.7	263	1,450	3,808	621	5,816	151
South Dakota	146	22.5	14	50	70	5	217	1
Tennessee	3,451	106.6	396	957	1,910	172	16,879	196
Texas	5,902	74.3	937	1,471	1,835	645	19,528	175
Utah	239	32.6	23	28	126	39	201	----
Vermont	156	42.3	18	18	96	24	62	2
Virginia	6,235	188.6	442	1,467	3,761	340	8,286	143
Washington	565	23.7	66	64	417	17	1,612	45
West Virginia	3,047	154.8	147	446	2,330	124	2,298	50
Wisconsin	1,198	34.3	88	204	683	53	822	10
Wyoming	132	44.9	20	31	57	7	119	----
Continental United States	156,009	100.8	9,551	32,287	100,195	8,021	243,857	5,378

[1] Including stage not stated.

Bureau of State Services Reorganization Announced

A reorganization of the Bureau of State Services of the Public Health Service, effective April 5, 1954, consolidates the activities of the Bureau into 6 divisions, 3 of them new.

During the past year the Bureau of State Services conducted a study of its organization and programs. Subsequently, a plan was submitted to the Surgeon General for reorganization of the Bureau's activities. The plan, recommended by the Surgeon General, has been approved by the Secretary of the Department of Health, Education, and Welfare.

In announcing the reorganization Surgeon General Leonard A. Scheele said, "Since the creation of the Bureau of State Services December 30, 1943, added responsibilities resulted in an increase in the number of operating divisions from 3 to 16. From time to time adjustments have been made in the organization to keep it constantly sensitive and more responsive to changing public health needs and to reduce administrative costs. The needs of the Bureau have changed over the past 10 years. Public health in this country is in a period of transition, confronted by many new public health problems resulting from a growing and a mobile population, a remarkable increase in life expectancy, and an increasingly complex and expanding industrial economy."

The grouping of programs under the three new divisions, the Division of General Health Services, Division of Special Health Services, and Division of Sanitary Engineering Services, brings together a variety of professional skills and related program functions which is designed to facilitate a more comprehensive and unified attack on basic public health problems. The three new divisions and the activities for which they are responsible are:

Division of General Health Services:
- State Grants
- Public Health Nursing
- Public Health Education
- National Office of Vital Statistics
- Arctic Health Research Center

Division of Special Health Services:
- Chronic Disease and Tuberculosis
- Venereal Disease Control
- Occupational Health

Division of Sanitary Engineering Services:
- Water Pollution Control
- Sanitation
- Engineering Resources
- Sanitary Engineering Center

The remaining three divisions—the Communicable Disease Center, the Division of International Health, and the Division of Dental Public Health—will retain their present titles and responsibilities.

The Division of Administrative Management has been abolished and its functions placed in the Office of the Bureau Chief under the general direction of the Bureau's executive officer.

The immediate staff of the chief of the Bureau of State Services is being reduced from 6 to 4 positions. They are deputy bureau chief, associate chief for program, executive officer, and information officer.

Heading the six divisions are:

Division of General Health Services: Dr. Jack C. Haldeman, chief; Dr. Aaron W. Christensen, assistant chief.

Division of Special Health Services: Dr. Seward E. Miller, chief; Dr. Robert J. Anderson, assistant chief.

Division of Sanitary Engineering Services: Mark D. Hollis, chief; Wesley E. Gilbertson, assistant chief.

Communicable Disease Center: Dr. Theodore J. Bauer, medical officer in charge; Dr. Vernon B. Link, deputy officer in charge.

Division of Dental Public Health: Dr. Thomas L. Hagan, chief; Dr. Donald J. Galagan, assistant chief.

Division of International Health: Dr. H. van Zile Hyde, chief; Dr. Emil E. Palmquist, assistant chief.

The heads of the last three divisions occupied these positions before the reorganization.

Dr. Otis L. Anderson, chief of the Bureau of State Services, has announced that Dr. Justin M. Andrews will serve as associate chief for program and Dr. W. H. Aufranc as assistant program officer; Richard W. Bunch will be executive officer, and Frank Acosta, Jr., information officer.

technical publications

Civil Defense Against Biological Warfare

Federal Civil Defense Administration Publication TM–11–10, November 1953. 37 pages. 20 cents.

This publication sets out to appraise critically the hazards of biological warfare (BW) and to describe defenses to be prepared. It modifies and supplements statements on BW in the earlier publication, "Health Services and Special Weapons Defense," AG–11–1, FCDA.

The text is divided into four areas: an appraisal of BW, the programs for defense of man, of animals, and of crops. BW is defined as "the intentional use of living organisms, or their toxic products, to cause death, disability, or damage in man, animals, or plants." While the extremes of opinion on the effectiveness of BW and available defenses are recognized, the evaluation is made "that a determined enemy can and may attack man, animals, or crops effectively by deliberately spreading pathogenic agents, covertly or overtly, alone or in combination with other weapons." It is considered that the casualties in man would be essentially limited to those directly exposed to the aerosol or contaminated water and food. Epizootics in animals, however, are quite feasible.

Foreign pathogens appear most likely as the weapons against animals or plants. It is probable that the common pathogens in unusual quantity or portal of entry will be favored for use against man; however, the potential BW value of those disease agents effective against both man and animals must be recognized.

Emphasis is placed on the strengthening of present public health measures of prompt disease reporting, communicable disease control, sanitation, and emergency medical services. The roles of local, State, and Federal agencies are cited as to programs and training to assure availability of competent professional and technical personnel.

Sources of Morbidity Data

Listing No. 1, 1953, from the Clearinghouse on Current Morbidity Statistics Projects. Public Health Service Publication No. 332. 1953. 159 pages.

The Clearinghouse on Current Morbidity Statistics Projects was organized at the first meeting of the Working Group on General Illness Statistics of the Public Health Conference on Records and Statistics, April 23–26, 1951. Its major objectives are to provide a systematic method of telling workers in the public health and medical fields where specific data on human morbidity may be obtained; and to afford a convenient means whereby those who are planning studies or surveys involving the measurement of illness, disease, injuries, or impairments can get in touch with others who have undertaken similar tasks.

This publication contains the first listing of projects on file in the clearinghouse. The information came from a canvass of over 600 organizations, institutions, and agencies made in July 1952; reports from 37 correspondents in the United States and Canada; and review of issues dating from 1950 of a half dozen national periodicals for published reports of projects meeting the clearinghouse criteria.

The projects are listed by major type or types of disease, injury, or impairment, and each listing contains an abstract of the project, the organizations participating, principal investigators, publication plans and references, and the name of one person to contact for further information. There are 18 major headings. An index by type of data collected and an alphabetic list of principal investigators are also included.

The listings of the clearinghouse are published primarily for the use of actual and potential contributors. Consequently, the number of bound copies available for other distribution is limited. However, tear sheets of the description of each study are kept on hand. Research workers or persons planning public health programs who would like to obtain a description of a particular project or of all projects in a particular field may write to the clearinghouse. Tear sheets for all pertinent projects that are on file will be mailed free of charge.

Births by Age of Mother, Race, and Birth Order, United States, 1950

Vital Statistics—Special Reports. National Summaries, vol. 37, No. 13, November 27, 1953

In 1950, 3,554,149 live births were registered, about the same number as the preceding year, and only 4 percent below the all-time high of 3,699,940 in 1947. This report gives annual statistics on the number of live births and fertility rates by age of mother, birth order, and race. Most of the tables and text present data adjusted for under-registration.

The upsurge in the crude birth rate between 1940 and 1950 marked substantial increases in fertility among women in all age groups except those nearing the end of the childbearing age span. In the 15–19 year group, the birth rate was 51 percent higher than for 1940; for women 20–24 years, the increase was 45 percent. The most fertile group in 1950, as in previous years, was the 20–24 year group. About one out of five women in these ages bore a child. While births of first children declined in 1950, following the decrease in marriages the previous year, the numbers of second, third, and fourth children increased.

technical publications

Handbook of Selected Biological References on Water Pollution Control, Sewage Treatment, Water Treatment

Public Health Bibliography Series No. 8. Public Health Service Publication No. 214. 1953. 66 pages; illustrated. 30 cents.

This handbook was prepared to meet the need of professional personnel responsible for water pollution control and related problems for usable references to biological literature pertaining to such problems. The references in the bibliographies were selected on the basis of their availability and potential usefulness to those not trained primarily in biology. The intent of the handbook is to provide information basic to a good understanding of certain biological problems that could arise in the course of water pollution control and related work.

In addition to water pollution control, sewage treatment, and water treatment, the references cover organism identification. Basic readings on ecology and water treatment are suggested in the introduction.

Mental Health Implications in Civilian Emergencies

Public Health Service Publication No. 310. 1953. 25 pages. 15 cents. Single copies available upon request to the National Institute of Mental Health, Bethesda 14, Md., or the Federal Civil Defense Administration, Washington 25, D. C., while the limited supply lasts.

Prepared by the Subcommittee on Civil Defense, Community Services Committee, National Advisory Mental Health Council, this publication is a comprehensive professional inquiry of value to mental health personnel as well as civil defense leaders. The text raises many searching questions—some civil defense organizations will find that they have made considerable progress in answering them. Others may discover that the questions open a new and important field for civil defense planning and action. The reader will find it useful to use these questions as a review of major parts of a civil defense program, with the objective of continuing the development of a better civil defense.

This document does not give, or pretend to give, solutions to all the problems raised. Nor does it, by stating problems, imply that these problems have not been considered before. There are, of course, no pat simple solutions to the problem of national mental health. However, the clarity with which the committee raises the problem may help speed earlier and better solutions.

Operation and Repair of Water Facilities in Civil Defense Emergencies

Federal Civil Defense Administration Publication TM 13-2. 1953. 63 pages. 25 cents.

This manual describes the operations, functions, and requirements of water utilities during civil defense emergencies. Part I discusses procedures required for production and distribution of water for essential emergency demands, especially fire fighting. Pre-emergency planning measures and actual operations following an emergency are also discussed. Part II is a discussion of the problems involved in maintaining the safety of the water supply, including detection and identification of contaminants, particularly special warfare agents, and protective measures.

The manual was prepared jointly by the Engineering Services Division and the Health and Special Weapons Defense Division of the FCDA, with the assistance of the Public Health Service. John Longwell, nationally known water works executive from Oakland, Calif., was engaged as consulting editor for the manual and was, in turn, assisted by a panel of prominent water works officials including M. B. Cunningham, W. R. LaDue, Dale L. Maffitt, W. Victor Weir, and Harry E. Jordan.

Marriages: United States, Each State and County, 1951

Vital Statistics—Special Reports, National Summaries. Vol. 38, No. 1, Oct. 20, 1953. 25 pages. Available upon request to National Office of Vital Statistics, Public Health Service.

There were 1,594,694 marriages in the United States in 1951, according to this special report of the National Office of Vital Statistics. The publication contains data on marriages or marriage licenses for each State and county for 1951, based on tabulations received from State health departments and local officials. A map showing percent of counties reporting marriages or marriage licenses is also included. The map shows that the proportion of counties reporting on marriages (or marriage licenses) was high. In 43 States, 95 to 100 percent of the counties reported, and in 5 States, 85 to 94 percent of the counties reported.

This section carries announcements of all new Public Health Service publications and of selected new publications on health topics prepared by other Federal Government agencies.

Publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication (including its Public Health Service publication number). Single copies of most Public Health Service publications can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington 25, D. C.